POULTRY FARMING FOR A LIVING

CYRIL GRANGE

pedigree poultry breeder, a winner of many awards at tests and shows, and he holds a number of official positions in connection with poultry farming, both local and national. He is thoroughly familiar with both the general and the specific difficulties which arise in poultry keeping, and he deals authoritatively with all these. The book is therefore of a very practical nature and will appeal both to experienced poultry farmers and to novices. The wider interests of those who are scientifically inclined and thus take an academic interest in such work are also acknowledged, mainly by suggesting books for further reading. The book will prove invaluable to all poultry farmers and those who are taking up poultry-keeping as a side-line to their main work. There are many useful illustrations in the form of photographs, and a number of tables of useful data.

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by

CYRIL GRANGE

Pedigree Breeder, Gold Medallist at Tests and Shows. Formerly Chairman of the National Country Packers' Association and Suffolk Egg Packers' Association. Member of the National Poultry Diploma Board and of the Ministry of Agriculture Advisory Committee on Poultry Marketing Standards.

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PREFACE

THIS book was written primarily for the many men or women, whether ex-service personnel, retired business people or eager youngsters, who seem unable to resist the desire to start up in poultry; but as the writing of the book progressed, and as I drew upon my notes and experience of thirty-three years, I discovered that I was describing the faults and errors of the past in a manner to prove of value to established poultry farmers and breeders, as well as to beginners.

It is difficult to see our own faults, or to appreciate the errors of a particular method or system, or to obtain unbiased advice as to merits or demerits of an item of management. I sincerely hope, therefore, that this book will be used, and the suggestions followed, by both novices and experienced poultrymen, and that benefit will be obtained.

When I started as an ex-serviceman poultry farmer in 1919, I found it difficult to get sound, unbiased advice. Academic instruction and county advisory assistance are to-day available for all, but there will always be the problem of finding a person to help you who has himself been ' through the mill '.

This book, then, has been written for the specific purpose of helping others, and is based upon a wide practical experience of all branches of the poultry industry, each of which was adopted because it had to earn me a living and return a reasonable net profit.

Where I required confirmation of a proposed suggestion, I have obtained it from a practical man who is an acknow-

ledged leader in that particular sphere. I hope you will rely upon the advice given.

In a book of this nature it was quite impossible to give complete technical details, and I have therefore described useful books for study or reference. Some of these will be out of print or out of stock. I suggest that, as you find your need for books, you order those which are still in print from your local bookseller, and obtain the others from the many second-hand bookshops to be found in all cities and in and near Charing Cross Road, London.

Prices and costs of equipment are not given, because they are too variable, but prices can easily be found by obtaining dealers' and manufacturers' catalogues, and costs by studying the results of experiments carried out at colleges and institutions and by food firms.

I hope, therefore, that this book will prove of outstanding worth not only to would-be poultry farmers, but also to those who, even though established, might well revise their methods, adjust their management and adopt a new policy for their own profit and for the good of this great industry.

I am grateful to my many friends in the industry who gave me facilities for photographing or who provided photographs of modern procedure. Acknowledgement is given with each photograph.

The book has been edited by Mr. L. J. F. Brimble, B.Sc., F.R.S.E., F.R.S.A., F.L.S.

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CHAPTER I

PRIMARY CONSIDERATIONS

INTRODUCTORY

WHAT is written in this first chapter is the most important of this work, for it concerns the making of the decision to adopt a proposition which must provide for a happy life or to give up a safe job for the unknown (at least, at the start).

Poultry farming has proved a magnetic attraction over the last thirty years to ex-service men of all ages, to youths of all qualities of brain and brawn, to business men tired of city life and the drudgery of an office, and to women of both town and country upbringing. Too often the lure of the hen has resulted in disaster. A rosy start, full of hope and confidence, has, to some, resulted in a life of toil and sweat, meagre profits and loss of capital. To others it has proved a successful venture.

Life is short. I cannot too strongly advise anyone who is contemplating becoming a poultry farmer to give the matter complete and careful consideration to the most minute detail. What I have to say is true and unbiased. It should be read and re-read. It is the result of experience gained by one who expected to find in poultry farming a fortune gleaned only on sunny days in shady pastures, with frequent long week-ends of pleasure; but who found it to provide a steady income got by working seven days a week, with a good deal of the important work to be done in heavy rain and wind, struggling in rubber boots, fighting disease and pests and trying to maintain profit in periods of slumped prices.

However, few successful poultry farmers would change their job.

Not only would I commend the advice to the beginner, but also to the established poultry farmer, who, in common with most of us, made so many and grievous blunders that he might well be advised to 'start again'.

FACTORS FOR SUCCESS

It should not be our concern to make poultry 'pay', but to ensure that they yield a satisfactory net profit commensurate with the capital invested, the labour used and the risks taken. Poultry can definitely provide this profit, either as a full-time job or a profitable part-time hobby, but only so long as the poultry man (or woman):

1. Has a 'love for livestock'—an inherent stock sense.
2. Is willing to work hard and to be certain that jobs are done before delay has resulted in the birds being adversely affected.
3. Has the basic technical practical knowledge necessary (see p. 11).
4. Adopts sound business principles and manages efficiently.
5. Does not experiment (or only with great caution).
6. Has sufficient capital, and apportions it correctly.
7. Starts right.

In return, he will enjoy a satisfactory income, obtain pleasant and health-giving work, receive the thrill of tasks successfully accomplished, be master of his own destiny and provide an established business for his children.

Let us be frank. Failure will follow if he or she:

1. Takes no interest in the stock.
2. Is lazy and too fond of leaving the work to others.

3. Has no experience at the commencement.
4. Is slack in buying and selling and in keeping books and records.
5. Wastes time and money trying unproved schemes.
6. Is under-capitalized.
7. Starts wrong.

Where the masculine is used, substitute the feminine when necessary, for women are particularly suited to the management of poultry.

PERSONAL REQUIREMENTS

The success of the undertaking depends on the *man*. It is a golden rule, if anything goes wrong, to blame yourself. True, the trouble may have been due to carelessness of the *boy*, but he should have been trained better, or more intelligent labour should have been obtained; or to a brooder lamp failing, but one should have used a better lamp, or taken more care of it, or suspected the possibility of failure and replaced it; or to an outbreak of disease, but preventive, measures ought to have been taken.

In a company there is only one person concerned with the making of profit, and he is the managing director. You are he. Whatever fault is allowed or mistake is made, it is your duty to overcome. Blame no one else.

What type of man is likely to succeed? He must possess the following attributes:

1. *He must be able to live in the country.*

He must be content with the placid life of a village and life a mile or more from a neighbour. He must understand that he will probably have to make his own electric light (or have oil lamps), pump his own water, put up with chemical sanitation and, indeed, be a 'jack of all trades'. He must not crave for company, yet he should be able and willing to

mix with the villagers, some of whom will be valuable to assist as odd-job men during a rush season.

The immediate pleasures will be simple, and provided in the home, as compared with the man-made city entertainments. The thrill from a movie drama will be replaced by the more quiet satisfaction of a task completed.

2. *He must be attracted to livestock.*

One either likes or dislikes animals. There is no halfway, and you cannot learn to like them. The fowls you keep must be appreciated as living individuals, and not as machines kept solely for what can be got out of them (Fig. 1). The person who likes dogs or wild life, who keeps 'chickens' in his garden and gets a pleasure out of them, and who enjoys the marvels of Nature is he who is likely to make a success of his poultry.

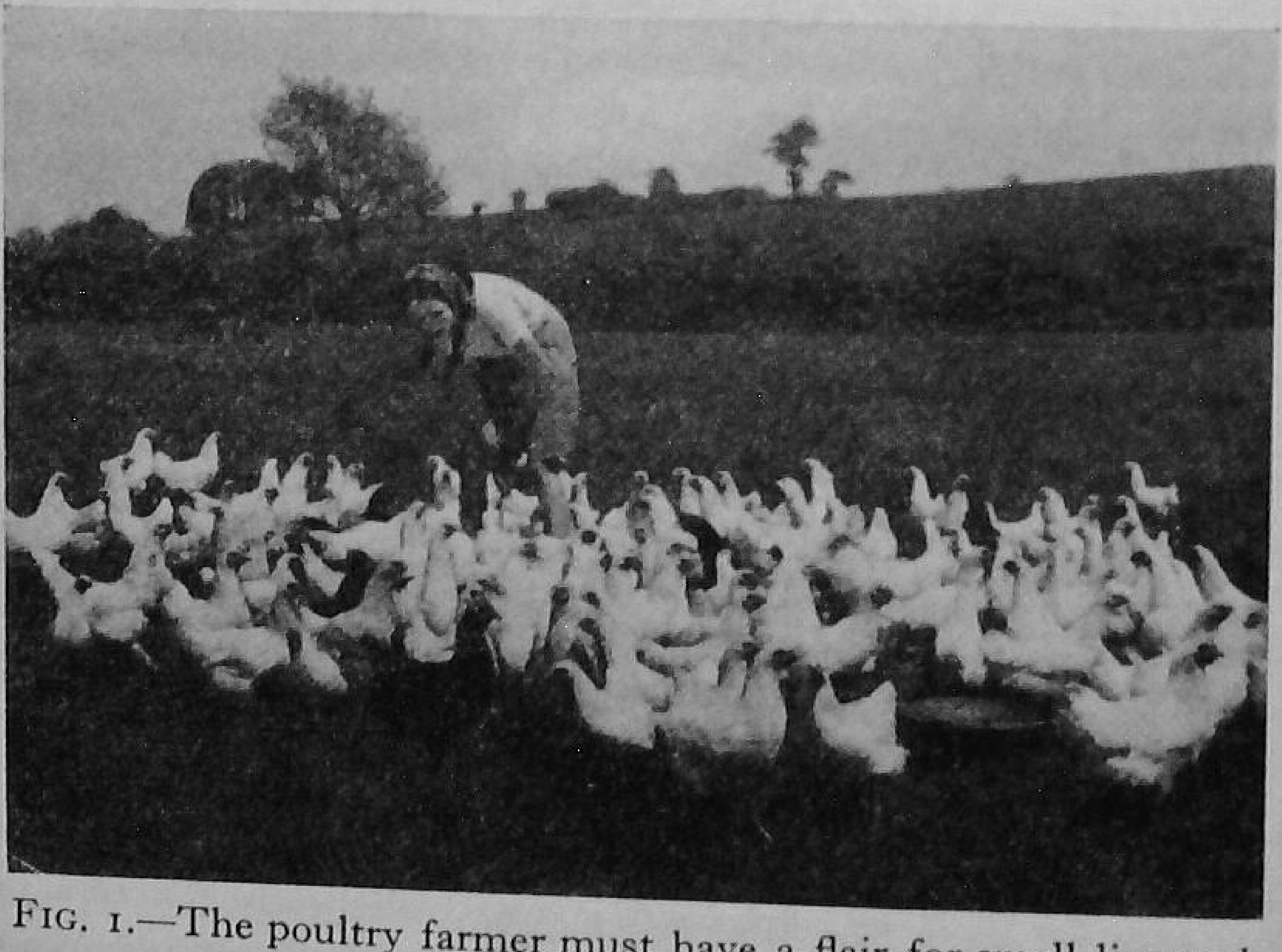


FIG. 1.—The poultry farmer must have a flair for small livestock

FIG. 2.—Conscientious work to ensure proper development is essential

Here are ducklings being reared for the table at ten weeks

3. *He must not be afraid of hard work.*

This need not suggest that life is to be slavery. It means that the work will be chiefly of a manual nature—poultry operations will not wait, and they must be done (Fig. 2); at certain seasons the day will prove to be twelve hours long, with scant time for meals—and that half-days must be foregone. The work has to be carried on in wretched weather, and one cannot base the life on the experience of a pleasant summer holiday spent on a farm.

4. *He must have some measure of business ability.*

Many poultry farms have failed because the owner wrongly believed that his job was solely that of a producer and his whole energies were devoted to outside work.

The successful man must keep simple books to show his sales and purchases and complete a trading account and/or

profit-and-loss account twice a year (September and March). (Read 'Farm Accounts', published by H.M. Stationery Office.)

He must be able to train himself to buy right and sell in the best market. He must be something of an organizer and tactful with labour. Advertising and publicity must engage his study.

He must be honest, enterprising, enthusiastic, considerate, patient and reliable—or as near as can be, for no one of us is perfect.

Given the above four qualities and average good fortune, success is more than likely.

PROSPECTS

Profit should be highly satisfactory. The slumps of pre-war days are likely to be avoided because of: (1) the better business methods adopted on the farm; (2) the closer and more friendly co-operation between countries; (3) the greater consideration given to farming by the Government and (4) the introduction of modern methods of preservation, such as the use of cold stores and quick freezing.

The severe bouts of disease and the high mortality which were such a feature of poultry life during 1932–39 will surely be obviated because of the improved methods of treatment, the increase in the number of Government accredited breeders and the severe culling of breeding-flocks necessitated during the war through the restriction of feeding-stuffs. If disease becomes rampant again it will be due to the careless and unduly rapid increase in the poultry population brought about by mating up unsuitable birds in an absurd effort to supply the heavy demand and to the failure to learn from our mistakes of past years. The remedy is in our hands.

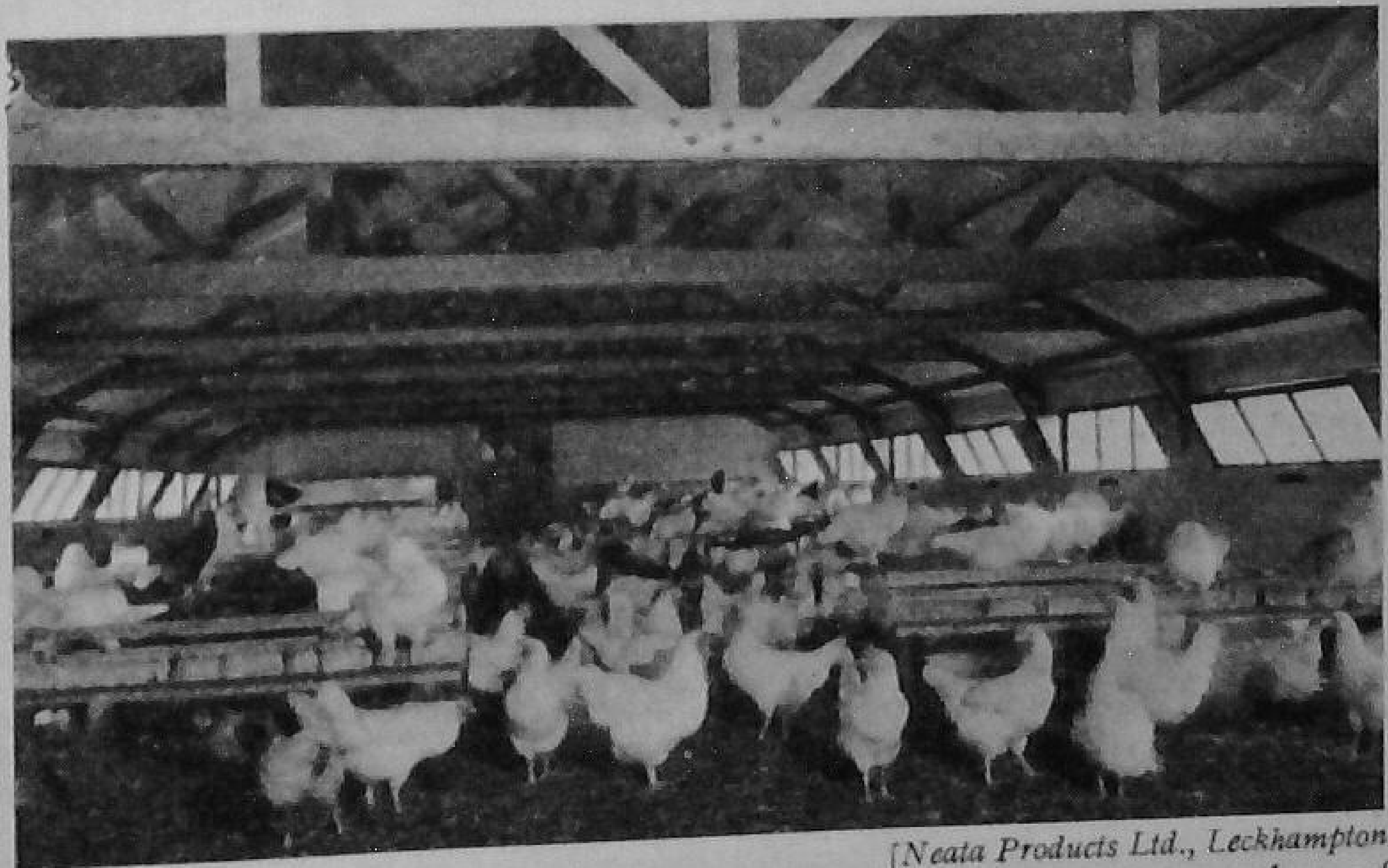
CAPITAL AND PROFITS

The capital necessary will depend on :

1. The proposed size of the farm.
2. The income desired.
3. The branch of the industry adopted.
4. Private income available.
5. The cost of the land and dwelling-house.
6. The ability and knowledge of the person to buy and to plan wisely and well.
7. Prices ruling at the time.

It is definitely advisable to start in a small way (to return merely a living income), to build up as practical experience is gained, and to reserve enough capital to be used to provide a weekly wage (to provide the bare essentials of life) for at least one year.

The best plan is to consider net profits, to fix the income desired and then to consult appliance and house manufacturers and breeders as to buying-prices of equipment and stock (Fig. 3).



[*Neata Products Ltd., Leckhampton*

FIG. 3.—Careful consideration must be given to the outlay of capital on the buildings

Here are White Leghorns in a deep-litter house

Let us consider egg production as being the branch to be adopted. The average annual net profit per bird should be a minimum of 8*s.*, and to yield a net annual income of approximately £8 per week, 1,040 birds will have to be housed. On the deep-litter house and hen-yard system (possibly the cheapest to-day) we shall require 2,000 square feet of floor space from a house 113 ft. × 18 ft., costing £890. Store-sheds would add another £40, making the grand total £930.

Ground will also be required for rearing, and therefore 10 acres would not be too much (to avoid fouling of the soil). The cost of this can be put at £750. (The house is not included, because you would have to live somewhere, whatever your job.) If capital is scarce, the ground would have to be rented at £4 to £7 an acre.

The 1,040 pullets, purchased at ten weeks of age in early July, can be computed at 13*s.* each; totalling £676. These would consume 147 cwt. of corn and mash, priced at £280 from ten to twenty-eight weeks, when they would lay and start profit-making.

So that the capital required would be: land, £750; buildings, £930; stock, £676 and food, £280, making a grant total of £2,636—to return a clear £416 a year, which is a sound proposition.

It must be thoroughly understood that this computation is only approximate and is intended to act as a guide only. The accurate figures can be obtained when the prospective poultry-farmer has ascertained the exact purchase prices, which will vary considerably, according to locality, timber, labour, taxes and Government control.

Frankly I consider that a person who buys wisely would need less capital than this, and the profit per bird might well exceed 10*s.*, depending on efficiency. The point I want to stress is that a start can certainly be made with a lot less

capital, so long as one is prepared to start small and build up.

When knowledge has been gained (by perusal of this book) as to the appliances, etc., necessary for another branch, the capital outlay necessary for that undertaking can be estimated.

One of the commonest and most fatal of mistakes is to imagine that the profit obtained by personal experience from a pen of a few hens in a garden may be multiplied to give the profit from a larger number. Thus, if £6 is made in a year from six hens, it is the height of absurdity to assume that £600 must result from 600 hens.

Conservative Estimates. In order to obtain a figure which shall not be exceeded (a vital necessity in most cases), it is imperative that every item likely to be involved be included. There will be the solicitor's cost of conveyance, etc., of the property, extra labour for erection, sundry transport charges and cost of fencing (drainage can come later, out of profits).

Any estimation of purchase prices (obtained from current manufacturers' catalogues) must be liberal. As a guide, before the War £900 would completely equip a 1,000-bird farm, which would show a net profit of from £250 to £400 a year.

Where to find the Capital. This can be from: (1) investments; (2) mortgages on property; (3) overdraft at the bank; (4) building society loan for dwelling (*not* for poultry-houses); (5) realization of life insurances (never advisable, although they can be used as bank security), and (6) relations who, having confidence in your ability, will advance money without security or come in as partners. Do not get into the hands of money-lenders.

Although it is fatal to be under-capitalized, it is equally disastrous to embark on a big scale which absorbs the whole of the capital available. To play safe, £300 to £500 should

be held in reserve to be used as living expenses for the first year.

Part-time Poultry Farming. If sufficient capital cannot be raised, it is possible to embark on poultry farming as a part-time business or as a profitable hobby. This is often advantageous for those with little knowledge. A careful study will lead to experience which will be of great value as the business is enabled to grow by putting back the profits as further capital.

Many successful farms have started in this manner. The position selected should be near the present home, so that whatever time there is to spare in the evenings and at week-ends can be spent with the poultry. An intelligent youth or an old-age pensioner can be employed for feeding, cleaning out, etc., either whole or part-time; or the poultry can be kept in the garden (see intensive housing, p. 72, and battery work, p. 61), so that the feeding can be done in the morning or evening by the wife or a relation, and the cleaning out, etc., at the week-ends.

The net profit is the figure which proves the success of your efforts, but it is influenced by a large number of factors:

1. Cost of establishment.
2. Economy of labour and wage rates.
3. Type and size of business.
4. Personality.
5. Efficiency of management.
6. Mortality at any age from shell to maturity.
7. Culling (p. 145).
8. Rate of production, whether eggs or flesh or stock.
9. Buying and selling efficiency (p. 206).
10. Cost of feeding-stuffs.
11. Selling price of eggs, table poultry and other produce.

12. Rate of depreciation of buildings.
13. Overheads.

Examples of net profit obtained before the war are here given:

1. On a capital outlay of £300 as a part-time hobby, from egg production, the total net yield, over a period of six years, was £710.

2. A milk roundsman on a capital of £110 built up a 2,000-bird laying battery in five years entirely out of profit, the work being done by himself and wife as time could be spared.

3. In two years, with a capital of £640, a commercial egg-farm was established which over eight years returned the owner £310 per year. In this instance £300 was held in reserve as wages for two years.

4. Two ladies with a capital of £2,000 made £400 profit in their second year, and in their seventh £1,200.

Following the advice set out in this chapter, poultry farming should prove equally remunerative in the future.

SPECIALIZED KNOWLEDGE

Poultry farming demands a good deal of highly technical knowledge, without which success is impossible. It is fatal to set up as a poultry farmer without such knowledge, and it is unsafe to imagine that it can be learned from one's experiences on one's own newly established farm. Certain details of it can be filled in, but the primary essentials, both theoretical and practical, must be known before one starts.

Knowledge can be gained by:

1. Attending a one- or two-year course at an agricultural college. (Study Form No. A695/T.E. on agricultural education from the Ministry of Agriculture.)

2. Spending a year as a working pupil on a well-known poultry farm.

3. Taking a correspondence course.

4. Reading books and weekly journals.

5. Keeping a few birds as a hobby and building up as knowledge is gained.

6. Visiting local poultry farms.

7. Joining a local poultry society.

N.B.—Ex-servicemen, should obtain particulars of agricultural training from the Ministry of Labour or their County Agricultural Executive Committee.

Few of us can spare the time or the money for college training, and indeed I consider such training should be followed by the hard graft of a successful farm. The idea of being a pupil is sound so long as one works on a practical farm, and not on one the profit of which is obtained from the fees of pupils. Some farms which specialize in pupils teach practically nothing. The farm chosen should be one specializing in that branch of the industry it is intended to adopt.

Correspondence courses are all right, but there is no practical experience, and this is so important, even if one only helps at week-ends or on holidays.

The combination of keeping poultry oneself as a hobby and of reading sound books is a good one, so long as one has the ability to digest what one is reading and to learn from mistakes. The literature referred to throughout this book may be studied with confidence, and will serve to complete the information given here.

CHAPTER II

LOCALITY AND SITE

In the heat of the moment, and in the enthusiasm to get started, it is a common error to rush headlong into the renting or purchase of a property, only to find later one or more serious handicaps which are sufficient to reduce profits or make life arduous.

I cannot too strongly insist that every possible advantage, disadvantage and eventuality of a property be considered fully. There must be no hurry. Many who are 1918 ex-service poultry farmers, or who became established between the two wars, are contemplating a move to a more suitable locality, and I hope these suggestions will also prove of value to them.

ADVICE

The first and outstanding need of the would-be poultry farmer is really sound advice. Too often he falls prey to the suggestions of a person who has 'an axe to grind' and who is interested, either directly or indirectly, in a possible monetary gain and whose judgment is influenced thereby.

As it is difficult to warn off these folks, I would suggest that advice be obtained from at least six people, and that it be carefully absorbed, compared and sifted, so that in the end a true opinion can be formed. Such advice can be obtained in this order from:

1. Estate agents (properties available and prices likely).
2. County agricultural organizers (suitability of land and locality).

3. County poultry advisory officers (pre-war success and post-war possibilities).

4. Egg-packing stations (density of local poultry population, and districts preferred).

5. Farmers (soil, markets and local advice).

6. Local inhabitants (particular reference to proposed property).

CONSIDERATIONS

In order to get a true picture of the manner of progress of this all-important subject, the factors affecting the ultimate decision, in order of scrutiny, may well be:

1. Locality.
2. Cost.
3. Area.
4. Soil and grass.
5. Drainage.
6. Roads.
7. Water and electricity.
8. Shelter.
9. Aspect.
10. Markets.
11. Transport.
12. Suitability for a proposed subsidiary.

One must consider the area, the type and the quality of land available for the growing of feeding-stuffs, so that the whole of the poultry food requirements need not be purchased.

It is unlikely that one will be able to find the perfect site embracing all the advantages and none of the disadvantages as set out below. So one should accept a site which can be improved without undue inconvenience and at a reasonable cost; but refuse that which, by nature of its position, has drawbacks which cannot be overcome.

LOCALITY

While the actual site of the farm will depend on items 1–12 above, there may be personal or private matters which will need to be considered. I would instance the desire of some folks to remain close to their family or relations, or to the inherent inability of others to go far afield and strike out afresh. I think it is wrong to allow such influences to exert much (if any) effect upon any decision.

A new-comer to a village or country is often held in far greater esteem than was accorded him in his birthplace or previous domicile; and this gratuitous goodwill is of no small value from a business point of view.

Considerations of health must naturally be allowed to affect the choice. If, on doctor's orders, one must live on the dry side of the country, then East Anglia it must be; if a bracing atmosphere is considered best, then Skegness might be chosen; if altitude is necessary, Yorkshire would be a good county, and so on.

Which County? That county which is sparsely populated lacks buying public and is not necessarily a cheaper county to live in; one which abounds in seaside resorts enjoys a heavy demand for eggs and table poultry in the holiday months, but suffers little inquiry during the winter; and a county containing large manufacturing areas can absorb vast quantities of farm produce, although the cost of land will be high (see markets, p. 30).

The Eastern counties are dry and bracing; Southern warm, mild and relaxing; Western wet, and Northern wet and cold.

I should not allow weather to influence the choice of location too much, because the actual success of the operations on the poultry farm is certainly not controlled or dependent on the weather, provided one is capable of mitigating any ill effects bad weather might otherwise bring about.

County	A No. of adult fowls in thousands	No. under six months in thousands	B Acreage in thousands to nearest thousand	C Population in thousands	D No. of adult fowls per 10 acres	E No. of adult fowls per ten of population	Adult ducks in thousands	Adult geese in thousands	Adult turkeys in thousands	Average annual rainfall in inches	Total poultry (actual)
ENGLAND											
Bedford	221	330	302	220	7	10	16	3½	6	24	576,552
Berkshire	262	422	454	311	6	8	20	5	11	24–29	721,451
Buckingham	319	450	480	271	7	12	23	7	32	23–26	831,161
Cambridge	266	421	315	140	8	19	16	4	5	21	711,782
Isle of Ely	222	232	240	78	9	28	6	2	1½	23	464,561
Cheshire	778	933	631	1,144	12	6	40	11	20	33	1,801,238
Cornwall	1,100	1,100	868	318	13	35	70	25	10	33–46	2,266,474
Cumberland	548	546	969	263	6	21	19	17	14	32–129	1,145,192
Derby	523	557	640	757	8	7	17	8	7	26–48	1,112,524
Devon	1,480	1,306	1,660	733	9	20	96	40	23	36–82	2,945,032
Dorset	432	503	622	239	7	18	23	7	9	27–39	974,334
Durham	290	350	628	1,486	5	2	7	7	8	25–33	662,648
Essex	851	1,330	962	1,755	9	5	44	11	32	18–24	2,267,442
Gloucester	515	567	783	890	7	6	31	12	12	25–34	1,136,619
Hampshire	653	824	933	1,014	7	6	33	10	77	28–33	1,596,768
Isle of Wight	75	69	94	88	8	9	4	1	2	29	151,297
Hereford	426	415	539	112	8	38	30	15	8	26–32	893,722
Hertford	261	450	405	401	6	6	20	4	12	25–29	748,589
Huntingdon	129	194	234	56	5	23	9	2	6	21–24	341,293
Kent	661	890	972	1,219	7	5	63	24	27	23–30	1,665,240
Lancaster	2,398	3,666	1,051	5,039	23	5	116	33	33	29–83	6,246,028
Leicester	413	464	524	542	8	8	13	6	8	25–26	904,497
Lincs, Holland	305	318	269	92	10	33	27	3	1	23–24	652,811
„ Kesteven	319	359	464	110	7	29	11	3	2	23–24	693,758
„ Lindsay	888	922	961	422	9	21	30	11	8	24–25	1,858,619

County	A No. of adult fowls in thousands	No. under six months in thousands	B Acreage in thousands to nearest thousand	C Population in thousands	D No. of adult fowls per 10 acres	E No. of adult fowls per ten of population	Adult ducks in thousands	Adult geese in thousands	Adult turkeys in thousands	Average annual rainfall in inches	Total poultry (actual)
ENGLAND											
Middlesex (and London) . .	27	46	224	6,036	1	0·04 ($\frac{1}{25}$)	3	1	1	23–24	78,426
Norfolk . .	1,257	1,538	1,304	505	10	25	250	18	73	20–28	3,135,781
Northampton .	343	375	582	309	6	11	15	6	10	22–24	748,964
Peterborough, Soke of	35	49	53	52	7	7	2	1	$\frac{1}{3}$	22	86,421
Northumberland .	210	203	1,279	757	2	3	8	6	8	24–34	435,274
Nottingham . .	404	560	529	713	8	6	14	5	10	22–26	993,298
Oxford . . .	332	472	471	210	7	16	18	5	8	23–27	835,669
Rutland . .	48	58	97	17	5	30	1	$\frac{2}{3}$	$\frac{1}{5}$	27	108,445
Shropshire . .	903	900	862	244	10	37	37	18	13	25–34	1,869,928
Somerset . .	928	926	1,032	470	9	20	59	19	11	29–45	1,943,910
Stafford . .	777	885	687	1,431	10	5	33	11	17	26–35	1,722,937
Suffolk, East . .	655	820	549	295	12	22	61	7	19	21–25	1,561,729
„ West .	360	434	391	106	9	34	25	5	13	25–26	837,397
Surrey . . .	224	432	449	1,181	5	2	33	7	11	24–36	707,899
Sussex, East . .	329	504	507	547	6½	6	26	10	8	27–30	876,544
„ West . .	208	326	402	223	5	9	28	6	10	28–30	577,846
Warwick . .	407	485	561	1,532	7	3	21	8	9	24–29	930,628
Westmorland .	168	155	505	65	3	26	8	8	4	35–88	342,826
Wiltshire . .	592	623	860	303	7	19	34	7	10	27–37	1,265,416
Worcestershire .	511	710	440	420	12	12	23	11	10	25–30	1,264,070
Yorks, East Riding.	721	815	737	483	10	15	30	10	7	20–28	1,582,748
„ North Riding	877	1,007	1,358	469	6	13	26	24	8	24–35	1,941,139
„ West Riding	1,294	2,627	1,625	3,353	8	4	76	26	35	23–62	4,057,570

County	A No. of adult fowls in thousands	No. under six months in thousands	B Acreage in thousands to nearest thousand	C Population in thousands	D No. of adult fowls per 10 acres	E No. of adult fowls per ten of population	Adult ducks in thousands	Adult geese in thousands	Adult turkeys in thousands	Average annual rainfall in inches	Total poultry (actual)
SCOTLAND											
Aberdeen	1,416	1,358	1,262	300	12	47	50	8	29	29–33	2,860,631
Angus	196	187	559	270	4	7	10	1	2	27–35	396,804
Argyll	98	64	1,990	63	0·5 ($\frac{1}{2}$)	16	5	1	1	43–87	168,710
Ayr	250	329	725	285	$3\frac{1}{2}$	9	6	1	3	36–50	589,685
Banff	283	266	403	55	7	51	13	2	4	34	568,267
Berwick	65	68	293	27	2	25	2	0·5 ($\frac{1}{2}$)	0·75 ($\frac{3}{4}$)	23–32	135,883
Bute	22	16	140	19	1·5 ($1\frac{1}{2}$)	12	1	0·3 ($\frac{1}{3}$)	0·2 ($\frac{1}{5}$)	49	39,538
Caithness	117	93	439	26	3	45	8	4	6	30	227,837
Clackmannan	6	6	35	32	2	2	0·1($\frac{1}{10}$)	0·05($\frac{1}{20}$)	0·1 ($\frac{1}{10}$)	40	12,091
Dumfries	237	228	687	81	3	30	9	1	3	36–53	478,208
Dumbarton	28	40	157	148	2	2	1	0·1 ($\frac{1}{10}$)	0·5 ($\frac{1}{2}$)	50	69,226
East Lothian	47	54	171	47	3	10	3	0·25 ($\frac{1}{4}$)	11	25	115,342
Fife	138	157	383	276	4	5	6	1	3	32	304,474
Inverness	146	96	2,659	82	0·5 ($\frac{1}{2}$)	18	7	1	5	27–111	255,059
Kincardine	166	153	244	40	7	41	5	1	2	33–34	327,970
Kinross	22	20	52	7	4	30	1	0·25 ($\frac{1}{4}$)	0·5 ($\frac{1}{2}$)	36	44,233
Kirkcudbright	118	91	576	30	2	39	4	1	2	44–54	251,571
Lanark	159	188	573	1,586	3	1	5	1	1	31–37	354,269
Midlothian	71	99	234	526	3	1·5 ($1\frac{1}{2}$)	3	0·5 ($\frac{1}{2}$)	2	24–35	174,971
Moray	87	84	305	41	3	21	5	1	4	30–31	180,530
Nairn	22	19	104	8	2	27	1	0·4 ($\frac{2}{5}$)	0·25 ($\frac{1}{4}$)	25–29	42,985
Orkney	425	343	241	22	18	193	11	3	3	35	783,707
Peebles	23	15	222	15	1	16	1	0·25 ($\frac{1}{4}$)	0·3 ($\frac{1}{3}$)	39	39,700
Perth	210	193	1,596	121	1	17	10	2	5	29–90	420,009
Renfrew	59	72	153	289	4	2	2	0·3 ($\frac{1}{3}$)	0·75 ($\frac{3}{4}$)	36–65	134,606

County	A No. of adult fowls in thousands	No. under six months in thousands	B Acreage in thousands to nearest thousand	C Population in thousands	D No. of adult fowls per 10 acres	E No. of adult fowls per ten of population	Adult ducks in thousands	Adult geese in thousands	Adult turkeys in thousands	Average annual rainfall in inches	Total poultry (actual)
SCOTLAND											
Ross and Cromarty	148	86	1,977	63	0·75 ($\frac{3}{4}$)	24	4	1	3	30–88	241,372
Roxburgh . .	64	53	425	46	1·5 ($1\frac{1}{2}$)	14	2	1	1	26–37	121,185
Selkirk . . .	13	8	171	23	0·75 ($\frac{3}{4}$)	6	0·3 ($\frac{1}{3}$)	0·05($\frac{1}{20}$)	0·4 ($\frac{2}{5}$)	31–34	21,266
Stirling . . .	77	166	289	166	3	5	2	0·3 ($\frac{1}{3}$)	0·75 ($\frac{3}{4}$)	31–50	180,050
Sutherland . .	40	21	1,298	16	0·25 ($\frac{1}{4}$)	25	1	0·4 ($\frac{2}{5}$)	1	32	63,322
West Lothian .	48	56	77	81	6	6	1	0·1 ($\frac{1}{10}$)	0·2 ($\frac{1}{5}$)	25–34	104,706
Wigtown . .	76	73	312	29	2	26	3	1	1	28–39	153,828
WALES											
Anglesey . .	158	130	177	49	9	32	7	10	10	35–38	313,849
Brecon . . .	102	80	469	58	2	18	8	8	3	40–60	200,544
Caernarvon . .	213	169	364	121	6	18	13	13	6	30–44	414,696
Cardigan . .	257	163	443	55	6	47	15	10	4	46–56	448,718
Carmarthen . .	352	305	588	197	6	18	22	11	6	48–57	696,031
Denbigh . .	242	223	428	158	6	15	8	7	4	32–45	483,955
Flint . . .	163	166	164	113	10	15	7	3	5	27–32	343,680
Glamorgan . .	137	165	469	1,226	3	1	11	12	4	40–85	329,943
Merioneth .	84	66	422	43	2	20	3	3	1	48–97	157,493
Monmouth . .	172	193	345	435	5	4	13	9	6	30–60	393,923
Montgomery . .	408	346	510	48	8	84	15	11	2	35–61	752,441
Pembroke . .	273	211	393	87	7	31	17	10	9	36–46	519,536
Radnor . . .	123	85	301	21	4	59	8	7	3	45–63	225,303

To Read the Charts on pp. 16–19. The information you will obtain about each county covers:

1. The size.
2. The popularity of poultry farming.
3. The present poultry population.
4. The population available for buying your produce.
5. The purchasing power of the county.
6. Possible scope and opportunity for increase in the head of poultry.
7. Opportunity for specialist poultry.
8. Rainfall.

N.B.—The number of poultry does not include those kept in gardens by domestic poultry keepers of which there are 1,200,000 keeping 11,000,000 poultry and providing 25 per cent of the British egg supply.

COST

Having decided on the county, you should then seek advice, first of a general nature and secondly of a specific type, from the sources suggested under 'Advice' on p. 13. It will be necessary to bear in mind the capital available (see p. 7) and to determine how much can be spent in the way of a capital charge—that is, on land (having allowed for equipment and stock).

No doubt the first problem will be to decide whether to buy outright or to rent. Here are the 'pros' and 'cons'.

To Buy

For	*Against*
1. Security is established.	1. Considerable capital is necessary.
2. Improvements add to value.	2. Possibility of reduction of capital on sale.
3. Freedom of choice when making alterations and improvements.	3. Should the locality prove unsatisfactory, an urgent sale might lose you money.
4. Disputes with landlords avoided.	

To Rent

Advantages	Disadvantages
1. Money which would have been sunk in purchase can be used for equipment and stock.	1. May be less easy to secure a desired place.
2. Less capital is necessary.	2. Possibility of being forced to move when the plant is well established.
3. Probably greater satisfaction for a person who is adopting this type of life for the first time, in that he could pack up and get out.	3. Less inclination to make costly improvements which, whilst working economically, add value to the property.

If buying outright, be sure to go fully into the question of value, and do not be led to believe the property is worth more than it would fetch on the market. Remember it is yours for keeps, and if any undiscovered serious 'snag' is found later, you will have to shoulder the cost of eliminating it.

If renting, take it on a lease of at least five years, with the option of renewal for a stated period and at stated rent. Have the agreement scrutinized by a solicitor to ensure that you are properly safeguarded. It would be an advantage to have an option of purchase.

Purchase or hiring price will be higher if the property is near to a large city; if it is a residential or seaside or spa area; if it consists of fertile agricultural land; if it has mains water and electric light and a metalled road; if it is in the hands of estate agents carelessly boasting it as 'highly desirable'.

The price will be lower if it is in a pastoral area more than twenty miles from a city; if the spending power of the local public is low; if it consists of poor-quality soil of little use for crop-growing; if it has few amenities or is on a muddy by-road.

CONTACT

The county and the mode of establishment having been provisionally agreed, comes the finding of the 'desirable property'. This can be done by:

1. Advertising in the local press (consult a copy of 'Willing's Press Guide' for addresses).

2. Advertising in the national press (scarcely necessary).

3. Advertising in a specialized journal such as *Dalton's Weekly*.

4. Advertising in the farming press (*The Smallholder*, *Farmers' Weekly* and *Farmer and Stockbreeder*).

5. Advertising in the poultry press.

6. Searching the advertisements in the sources named under 1–5 above.

7. Making inquiries of local estate agents and auctioneers.

8. Getting contacts through friends in the agricultural industry.

When a contact is made or an offer received, may I again stress the need for making very complete investigation and seeking reliable advice (even if you have to pay for it)? To take a hasty wrong step now may end in failure.

No mention has been made of what price to pay, because it would have to be guesswork. It is suggested that by making inquiries from the sources mentioned, an accurate estimate of the average values of land can be obtained. *Safety lies in obtaining more than one opinion and from more than one specialized source.*

AREA

The acreage will depend on: (1) the capital available, (2) the projected plan of operations, (3) the ultimate head of stock to be carried, (4) the demands created by home rearing and (5) the business to be operated—that is, breeding will need more ground than laying-fowls.

What I am going to tell you now is of vital importance: *get more land than you think you will require.* Many pre-war poultry farmers ran into serious trouble because their land

was over-stocked, foul and germ-ridden. It is better to rent too many acres than purchase too few. If you are lucky enough to obtain an option of renting more land as the years go by, well and good, although I should prefer to be sure, and take it at the start.

Land surplus to your requirements can be let for pasture (see that your agreement permits you to sublet).

As a guide, the *minimum* safe acreage for each branch is as follows:

1,000 birds for commercial laying on free range with no home rearing . . . 10 acres.

1,000 layers with replacements reared on the farm . . . 20 acres.

1,000 layers on the battery system with replacements bought in . . . 3 acres.

1,000 battery layers with free range rearing . . . 13 acres.

1,000 layers intensively housed (deep-litter or sun parlours) with bought-in replacement pullets . . . 5 acres.

1,000 intensive layers with free range rearing . . . 15 acres.

500 breeders (where the branch is the production of breeding-stock, growing pullets and stock cockerels) . . . 15 acres.

200 table chickens weekly (sold at sixteen to twenty weeks . . . 8 acres.

If these acreages can be increased by 50 per cent, well and good.

The three types of property likely to be of interest are:

1. Land only.
2. Land, house and buildings.
3. An established poultry farm.

Land only. This is quite acceptable, except that money must be reserved for building the house or bungalow and the outbuildings. If renting a place, choose a property which has a house and buildings, unless it is possible to have an option to purchase (at an agreed figure).

Land, house and buildings. Much time and trouble are saved if a house is available as a dwelling and decent outbuildings for food store, incubator room, straw-yard and so on. It may be easier to obtain land with no buildings on it, in which case it might be better to purchase outright with the aid of a mortgage, so that a house, etc., can be safely erected.

Established Poultry Farm. This requires extremely careful consideration. The land may be foul or germ-ridden; the houses in poor repair and of unsuitable design; the layout costly of labour. These drawbacks can be successfully overcome provided the purchase price is low enough to leave capital available.

Post-war ideas are radically different from those of pre-1939, and it might be better to plan and build-up on modern lines than to re-design an existing plant.

SOIL

It used to be the fashion to delegate particular breeds of fowls to certain types of soil, such as the yellow-legged breeds (for example, Rhode Island Red) to clay soil; but this is all wrong. A knowledgeable man can succeed on a given soil with any breed. It is equally erroneous to accept the view that poultry will thrive on cheap and poor soil. What is a fact, but rarely recognized, is that a soil originally prejudicial to poultry can be improved beyond belief by drainage, re-seeding, cultivation and folding, though such improvement will cost money, and thus any likely work on the chosen site must be allowed for in the estimation of costs.

The chief types of soil, with their features, are :

Type	Advantages	Disadvantages	Mode of improvement
1. Clay.	Retains moisture during drought. Grows good grass.	Inclined to be cold and wet. Crops are late in growth. Difficult to cultivate. Muddy in winter.	Must be well drained. Responds to liming and manuring with 'long' manure.
2. Loam.	The best soil, being warm, and responsive to early sunshine.	Usually more expensive to buy or rent.	
3. Sand or stony.	Well drained. Usually cheap to buy.	Needs ample manuring. Grows poor grass. Hot and dry.	Requires good feeding with short manure.

The county agricultural organizer (to be found at the county or shire hall or the County Agricultural Executive Committee's offices) will give an expert opinion as to soil type. Inquire also as to drainage, for this can be a costly operation.

There are many intermediate soil types, such as heavy and light loam, heavy clay and heavy silt. Soils on the heavy side (despite their coldness) are much to be preferred to light soils (despite their warmth and superior winter texture), because they will grow ample good grass, which is of extreme value for all poultry (adult and chicks) on range.

If the prospected land is already to grass, then its quality can be judged by its content of rough-stalked meadow-grass, perennial rye-grass, crested dog's tail, timothy and cocksfoot. Good-quality grass is green with ample leaf and vigorous growth ; poor grass is short, thin and brown.

It is well to remember that poultry improve grass-quality rapidly, especially if that on clay soil is drained and limed and that on light soil assisted by manuring. A good book

on soil properties is 'Fream's Elements of Agriculture', by Dr. D. H. Robinson, and a useful publication is the 'Improvement of Grass Land' (Ministry of Agriculture Bulletin No. 3).

DRAINAGE

Owing to the land-improvement schemes initiated during the War, much land has been drained. This is a vital operation to: (1) improve warmth, (2) reduce puddling and mud, (3) preserve the fine nutritious grasses and (4) prevent flooding. It would be well to inquire if drainage has been carried out and, on purchase or renting, to obtain a plan of the drains, so that they can be kept in good order.

ROADS

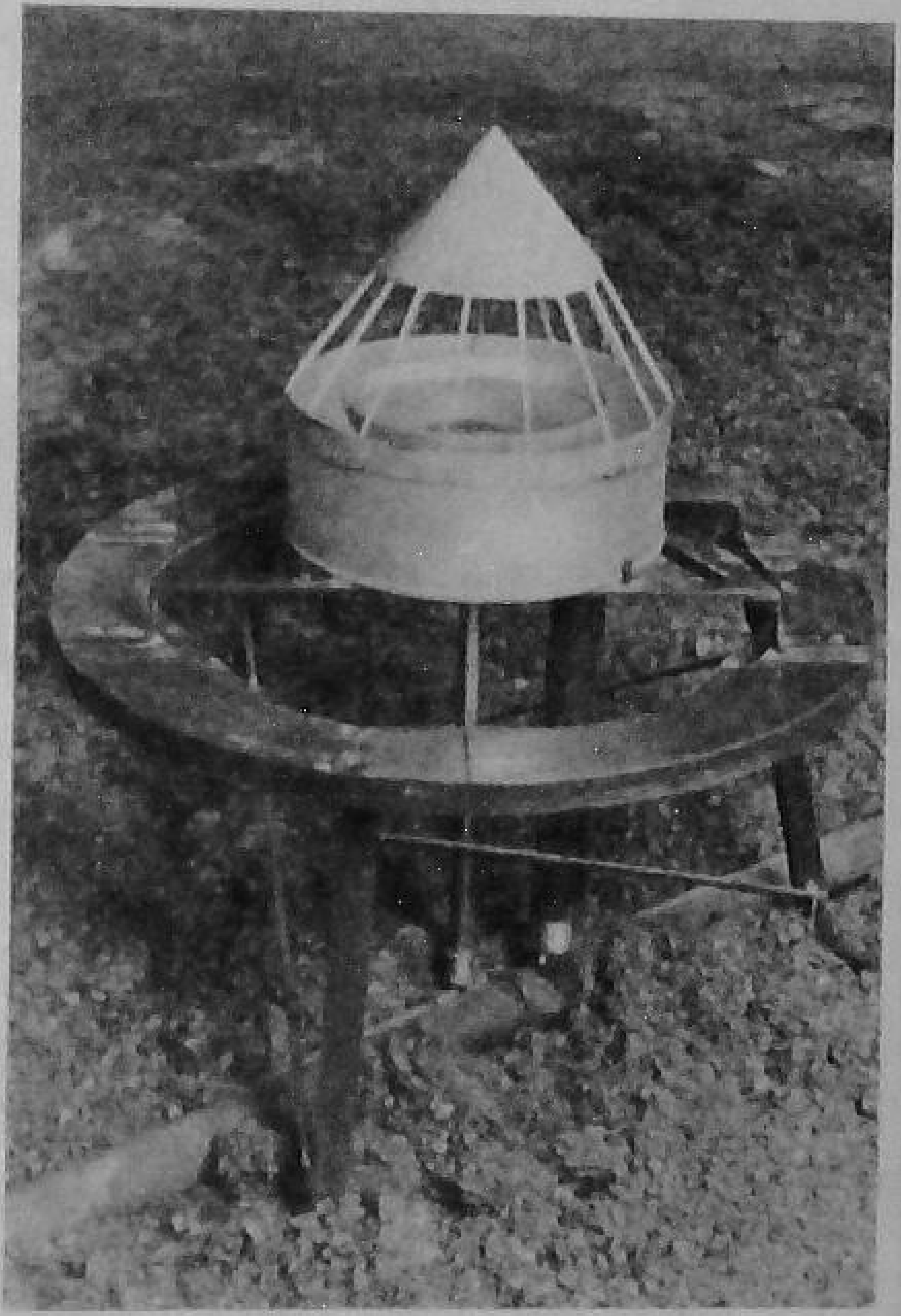
An absolute necessity is a metalled road (or gravelled, if you must) which is pleasant to use during the worst weather. So many cheap (and nasty) properties have access only by a lane or drift which becomes almost impassable during the winter. An honest appreciation of the proposed property will be got if inspected any time between November and February inclusive. If it is visited during the period of sunshine, tree-leaf, flowers and grass, try to picture it in the dull, drab days of winter. So different will it be then that a wrong (and all too delightful) impression can all too readily be conceived.

To return to roads. If the property is on a busy main road, particularly if traversed by folks on holiday bent, it will possess the attribute of being suitable for the establishment of a roadside stall, upon which a great and varied quantity of home-grown produce can be sold at retail prices, with no other cost than the employment of a salesgirl. Even such a person is unnecessary, if an electric bell is fitted to the stall to give a call to the house (which call must be answered promptly!).

On the other hand, the selection of a property should not be influenced by the ability to establish such a stall.

WATER AND ELECTRICITY

Water in large quantities is another indispensable requirement (Fig. 4). The supply *must* be ample, constant and of suitable purity. If there is the risk of failure during a period of drought (confirm the suspicion by a visit to the local 'pub', post office or grocer's shop), then think twice before taking the site.



[Thornber Bros. Ltd., Mytholmroyd, Yorks.

FIG. 4.—Mains water is essential in order to be able to install automatic water vessels as illustrated

On the other hand, it may be a practical possibility to sink a well or divert a stream; but expert advice should be sought. When the farm is established, I would strongly advise the laying of water-mains and the erection of stand-pipes at convenient places, to save the enormous labour and time carting water.

Although most poultry farms have hitherto been able to succeed without electricity, the time is not far distant when electric light and power will be essential, not only to save time and labour, but also actually to ensure net profit. Quite frankly, I should hesitate to select a property which is so far removed from any future mains line that the installation of electricity is unlikely.

The age of mechanization is at hand, and as soon as cheap electric supply is laid on, full use must be made of it, to save labour and to speed operations.

SHELTER

Large fields with no trees or hedges are not good for poultry outdoors. A much more valuable site (and one for which I would willingly pay more money) is made up of several small fields or meadows divided by high hedges and ditches and, better still, carrying trees, copses or spinneys.

It is possible and feasible to plant shelter-belts of such plants as Myrobalan plum, evergreen privet and Lombardy poplars; but for the first three years they will not offer much protection, and the cost of the young plants is not inconsiderable.

The ideal spot is one pleasantly broken by wooded clearings, thick hedgerows and tree-belts, and watered by an ever-flowing stream meandering through the meadows. Anyway, one can strive to find a property with some sort of shelter.

ASPECT

The ground should either be level or have a gentle southern slope. Northern aspects are inclined to be cold, because the sun's rays always reach the ground at an acute angle, and eastern slopes are subject to biting winds.

Naturally a property would not be refused if only a part had an unfavourable slope. Sun is so essential for chick-rearing that the warmer aspects might well be reserved for this purpose.

Steeply sloping ground should be avoided. I used to marvel at the strength and toil required to push or pull food- and water-barrows up the severe incline of a well-known poultry farm in Kent. I resolved I would always advise

against such labour, which is really unnecessary, for that same farm would have been excellent for cattle or sheep.

I have seen it advised that the chick-rearing ground should be on a considerable slope, to allow of drainage. Have none of it. The weariness of trudging up slopes, even empty-handed, makes tasks a burden. Nor is it correct to say that drainage is more efficient on land that slopes. It is not. True, the operation of draining is made more simple, but natural percolation of water is not necessarily assisted.

FIG. 5.—The battery system, while the most costly to install, returns the greatest net profit per bird and requires the least area of land

N.B.—If fruit-growing is to be adopted as a sideline (and I would strongly recommend it, see p. 242), then be sure to choose a site which is not low-lying or close to a river, or the severe frost-pockets which form will do much towards reducing the fruit yield each year.

For a mechanized system such as laying-batteries (Fig. 5), an intensive method such as deep litter, or a farm-yard feature such as hen-yard, the poultry are so concentrated and protected that type of soil, shelter and aspect matter little. Area of land needed can, if necessary, be reduced to that upon which the buildings are actually situated. Thus one might well purchase or rent a small farm with good buildings which could be used for housing the poultry (whether layers

or fatteners) on a concentrated system and the land for growing the crops. Actually this is a scheme I can recommend.

MARKETS

It is well to consider the available outlets for the produce (see 'Marketing', p. 200). These will be wholesale (packing stations, wholesale markets, auction markets and restaurants and local shops) or retail (housewives and the best hotels). The retail does not necessarily pay the best, because there are many services which have to be rendered to the customer.

If the farm is close to a large town (especially if industrial), the demand will be regular and the cost of transport small; if in the vicinity of a seaside resort, the summer inquiries will be heavy, but the winter calls small; if a considerable distance from a consuming centre, then the cost of transport will be greater and most of the sales will be of a wholesale nature.

TRANSPORT

Much use, both inward and outward, will be made of the railway. It will clearly be an advantage if it is fairly close. The disadvantages of being remote (eight miles or more) from the railhead are not so great as is usually suggested. The railway deliver and collect with satisfactory frequency and at a low cost, and livestock are given special consideration. Where the proposed farm is 'in the wilds' and a rail lorry service infrequent, that would constitute a severe drawback.

It would certainly be advisable to be on the telephone, so that rail orders can be made without delay.

A local 'bus or carrier service of unfailing regularity is an asset, and is generally established in most villages, and this combined rail and road service should provide satisfactory service.

There are so many other considerations in the selection of a farm that the nearness to rail cannot be regarded as of great moment.

One other point: transport for the man and his family to the nearby market town. This should be possible and frequent. Sooner or later one becomes tired of being 'buried in the country', and a regular bus service is appreciated.

SUITABILITY FOR A SUBSIDIARY

In Chapter III I shall give reasons why a side-line should be adopted. If it is to be successful, attention must be paid to suitability of the location. Other small livestock are effectively catered for if the site is suitable for poultry; but where the growing of any crops is to be undertaken, more care must be paid to the fertility, depth and quality of the soil.

CHAPTER III

CHOICE OF BRANCH

CAREFUL consideration must be given to selecting that branch of the poultry industry which is most desirable for a particular person.

The choice will depend on :

1. Current net profit possible.
2. One's own preferences.
3. Skill and experience available.
4. Local and national markets.
5. Area and type of land at one's disposal.
6. Capital available.

One must also decide whether the intention is to become a specialist or to adopt a policy of general poultry farming.

Specialist or general? Under the specialist plan one devotes the whole of one's time and money to building up the selected branch to the exclusion of all others. Although this plan is recommended by many experts, I cannot help thinking that it is better to have more than one string to one's bow, in order to cash in on one branch when another may be suffering from a slump or over-production.

The danger, of course, lies in being jack-of-all-trades and master of none, meaning that it would be unwise to try out several branches and make a failure of one or more because of the lack of detailed technical knowledge which each and any most certainly requires. In no circumstances should any particular branch be adopted until one has most care-

fully investigated not only the advantages and possibilities, but also the drawbacks and risks.

An example of a specialist branch is pedigree breeding, in which the main profit is obtained from the sale of hatching eggs, chicks and stock of all ages. The fact that the birds also lay eggs surplus to hatching requirements in no way entitles the breeder to consider himself a commercial egg-farmer.

On the other hand, a person could be regarded as a general poultry farmer if he kept certain flocks purely for commercial eggs and in addition ran a section for breeding-stock (not necessarily of pedigree quality) from which were sold day-old chicks to small poultry keepers.

Summing up, I consider that the most successful poultry farmer is he who embarks upon a branch only when a sufficiently complete knowledge of that branch has been gained or is available, and only when the most careful investigations have been made and have proved the practical and profitable possibilities. By such a safe procedure it is, in my view, quite sensible to add and develop a new branch or branches as and when the time is deemed appropriate.

THE BRANCHES AVAILABLE

1. Commercial egg production.
2. Pedigree breeding.
3. Commercial breeding.
4. Table poultry production.
5. Commercial day-old chick production.
6. Exhibiting (including bantams).
7. Turkey production.
8. Ducks.
9. Geese.
10. Subsidiary enterprises embracing livestock and crop growing (dealt with in Chapter XII).

COMMERCIAL EGG PRODUCTION

This branch concerns itself with the production of new-laid eggs in regular quantities all the year through. The eggs are sold wholesale to packing-stations (direct or through auction markets) or wholesale to dealers or retail direct to consumers. The chief source of income is therefore from eggs, and it is necessary to manage in such a manner that the egg supply is at least 50 per cent from pullets from October to January inclusive.

Market egg prices fluctuate in the post-war years as they did in the pre-war period, the highest rate of profit is to be gained during the winter months while the prolific production from February to May may command prices barely above the cost of production. I consider that modified price control resulting from National policy is necessary to secure the egg industry from spring price slumps, which in pre-war days resulted from (*a*) heavy home production, (*b*) failure to equalize supplies by commercial storage and (*c*) lack of effective control of imports.

Other sources of profit under this heading are the sale for table of one-year-old cull layers (worthless for laying in their second year) and two-year-old hens (finished their profitable laying life). These should be sold just before moulting, and rarely require fattening. A further income results from the sale of fresh poultry droppings to market gardeners (worth at least £6 per ton); unless one arranges with a nearby farmer to make a level exchange of straw and chaff for the poultry manure.

The main expense is feeding, followed by preservation and repair of houses and runs, and the renewal of food and water apparatus. Much of the labour cost can be based on the agricultural rates, as the work is somewhat mechanical, consisting of preparing and delivering the grain, mash, grits

and water in the correct quantities; cleaning, preserving and repairing houses or appliances and runs; collecting, cleaning and packing eggs; maintaining quality of layers and preventing disease.

Commercial egg production is probably the safest branch of the industry, although not necessarily the most profitable. It requires less skill, experience and knowledge than other branches; is least dependent on area or type of land; possesses undoubted advantages, in that one of many systems of housing can be chosen (Chapter IV); provides a regular weekly income.

The net profit which may be expected is from 8*s*. per bird per year, depending on the effect of the multitude of factors explained in this book.

PARTICULARS OF FEEDING AT THE YORKSHIRE FEDERATION LAYING TEST, LTD.

	Foodstuff cost per dozen eggs	*Cash received per dozen eggs*	*Margin*	*Average annual food cost per bird*
1945–46	17·20*d*.	39·83*d*.	22·63*d*.	20*s*. 1·23*d*.
1946–47	17·59*d*.	42·91*d*.	25·32*d*.	20*s*. 3·86*d*.
1947–48	20·01*d*.	47·42*d*.	27·41*d*.	25*s*. 9·93*d*.
1948–49	19·42*d*.	46·44*d*.	27·02*d*.	26*s*. 2·89*d*.
1949–50	20·90*d*.	53·44*d*.	32·54*d*.	28*s*. 2·13*d*.
1950–51	25·62*d*.	51·37*d*.	25·75*d*.	34*s*. 11·91*d*.
1951–52	27·84*d*.	54·83*d*.	26·99*d*.	37*s*. 10·77*d*.

Literature which is of interest is: 'Modern Poultry Management', by H. Howes; 'Management of Farm Poultry', by H. Howes; 'Poultry for the Many', by W. W. Broomhead; 'Modern Poultry Husbandry', by L. Robinson; 'Successful Poultry Management', by M. A. Jull; 'Poultry Farming', by A. Thompson.

PEDIGREE BREEDING

Pedigree breeding means the production of stock (of all ages) whose ancestry is known and recorded and whose qualities for a particular purpose are above the average. Such stock is purchased for the specific purpose of improving existing strains, of introducing desirable characters (for example large eggs) and of establishing first-class foundation flocks.

Income results from the sale of hatching-eggs (up to 63*s.* dozen), day-old chicks (up to £6 per dozen), three-month-old pullets or cockerels (up to £2 each), about-to-lay pullets (up to £3 each), breeding-hens (up to £3 each) and stock cockerels (up to £5 each). These prices are for first-class stock sold by well-known breeders. The beginner could not hope to realize more than half these prices until he had proved the value of his strain at laying trials or by continuous good service and satisfaction to customers.

Other sources of income are new-laid eggs (produced when hatching eggs are not required), cull and aged hens, cocks, surplus cockerels and manure. Perhaps it might be thought desirable to take pupils for training at two or three guineas a week; but never let this side-line cloud the real purpose of the farm, and *do* give them a square deal.

Expenses are considerable, for the following reasons: several small breeding-houses and runs are required, as compared with the larger and proportionately cheaper houses for commercial egg-layers; labour is high because of the mass of records necessary, and it must be of good quality, for mistakes in recording should never occur.

First-quality grass-land is necessary, and of ample area to provide clean range for chicks and fresh ground for breeders. It would certainly be desirable to become an Accredited Breeder under the Government Scheme (apply

to the County Poultry Advisory Officer at your County Hall) not because of the stimulus towards maintaining health and quality (no real breeder needs such control) but because of the advertising value. The Poultry Club Panel of Breeders is also worth joining.

The work entailed is (in this order of sequence): trap-nesting pullets; selecting yearlings for the breeding-pens; mating up to the most suitable sires; recording and marking the eggs from individual hens; incubating the eggs; hatching the chicks so that their parentage is known; identifying the chicks by wing- or leg-banding; growing on; culling out; placing new pullets in the laying houses; trap-nesting for egg records, and then round again.

The above explains full pedigree breeding, but a number of the mated pens, although trap-nested birds, may be flock-mated and the eggs and stock from them sold without individual records.

Useful books to read are: 'Modern Poultry Practice', by M. W. Taylor; 'Poultry Breeding', Bulletin 164, Ministry of Agriculture; 'Poultry Breeding', by M. A. Jull; 'Poultry Husbandry', by M. A. Jull; 'Heredity in Poultry', by R. C. Punnet; 'The Standards of the Breeds', by the Poultry Club; 'The Inheritance of Fecundity in Fowls', by O. Smart.

COMMERCIAL BREEDING

Anyone who mates male with female poultry can be rightly termed a breeder; but he is in no sense a pedigree breeder, although many claim to be so. I prefer the term 'commercial breeder', which implies a person who pays careful attention to flock records, health and external quality, but who does not trap-nest and record individually.

There is definitely a place in the industry for such breeders, provided they strive to improve their flocks year by year.

Their purpose is to supply eggs and stock (of all ages) at commercial prices to egg-farmers, general farmers, domestic poultry-keepers, table-poultry producers and hatcheries for the primary purpose of producing new-laid eggs or poultry meat. Such breeders may become accredited in the 'commercial' grade.

The sources of income are primarily from the sale of hatching eggs, chicks, growing pullets, mature layers, stock cockerels, and secondarily from the disposal of commercial eggs, table hens, surplus cockerels and manure.

Outgoings are far less than with pedigree breeding. Housing will probably be planned in larger units (flock-mating instead of individually headed pens), and the labour required will not be so extravagant, as there will be little recording. Less skill is necessary. Indeed, commercial breeding often results as an offshoot from commercial egg production, to become a useful additional branch.

Books to study are those given under 'Pedigree Breeding'.

TABLE-POULTRY PRODUCTION

This branch is highly technical, and consists of producing table-fowls, conditioning them to first-quality carcases, preparing them for the slab or for the oven, and selling at the most appropriate ages in the most profitable channels. The supply and sale should be continuous throughout the year, in order to ensure a regular income; but the net profit varies considerably.

An income is also made from manure and feathers, the sale of the latter paying for the cost of plucking.

Expenses are made up of: feeding; repair and cleaning of fattening arks and cages; labour for feeding, cleaning, plucking, packing and marketing. The amount of labour necessary will depend on the type of business, which may vary as follows: (1) table chicks may be purchased, brooded

and reared and grown on to killing age; (2) mated adult pens may provide the hatching-eggs which are incubated and the chicks reared to killing age and (3) young cheap surplus cockerels may be bought from commercial poultry or general farmers and fattened up for killing.

FIG. 6.—The production of 'Surreys' by cramming with Sussex ground oats, milk or fat

A luxury product (of pre-war days) which may never return

Three variations in the above are possible. The birds may be fattened in a limited run (least labour required); or put in pens and fed in troughs (rather more labour involved); or put in pens and crammed (the most labour necessary, and this of a specialist type (Fig. 6)).

Again there are two methods of marketing. One is to sell wholesale live or dead weight, to a dealer or packing-station; the other is to sell dead and processed (Fig. 7) to hotels, shops and consumers, semi-wholesale or retail, in which case considerably more expert labour is required for killing, plucking, stubbing, singeing, tying or shaping, cooling, grading, packing, booking and despatching. The sale should preferably be for cash; credit is costly and should be avoided where possible.

[*Cope & Cope Ltd., Reading*

FIG. 7.—Killing and plucking by the wet process

Modern rapid pluckers are necessary to save time and reduce labour costs

To estimate net profit is difficult, but one should expect 1*s*. to 2*s*. per fowl of 4 lb. and over. Before the War, prices during periods of glut (for example, when specialist table poultry were sold at the time when farmers were unloading surplus cockerels on to the market from July to September) did not always cover costs of production. Steps are being taken to equalize supplies by preserving poultry in good condition by quick freezing and by extended refrigerated storage, and I would suggest that producers keep informed of these processes. They will become popular and of inestimable worth.

Technical works of value are: 'Table Poultry Production' (Ministry of Agriculture Bulletins Nos. 64, 91 and 18); 'Marketing Poultry Products', by Benjamin and Pierce.

COMMERCIAL DAY-OLD CHICK PRODUCTION

The business of this branch is to produce, sex and despatch day-old chicks of the popular pure breeds and first crosses, for which there is a demand (Fig. 8). There are four types of hatcheries: (1) the most common one, which buys hatching eggs from breeders (who contract to supply) and which hatches chicks from these eggs only; (2) the breeder-hatchery, which hatches chicks from eggs produced on its own farm only; (3) the combination of numbers 1 and 2; and (4) the hatchery which engages in rearing and selling young pullets and cockerels as well as selling chicks at a day old.

[Western Incubators Ltd., Hanningfield, Essex

FIG. 8.—Commercial day-old chick production requires a modern cabinet incubator, with automatic turning

It is a specialized business, and requires considerable capital (both for incubators, and to start and maintain a national advertising campaign). Business ability is necessary to plan publicity and to maintain sales; poultry experience to understand the selection and mating up of breeding-pens (the producers under contract are under the part control of the proprietors of the hatchery); technical ability to operate the incubators and tact to satisfy both suppliers of eggs and buyers of chicks.

Little ground-space is required. Successful hatcheries are established in the country and in towns. A sound

building is necessary which is capable of being insulated, of sufficient size for the job (both floor area and air volume), close to a main highway and railway station and within an area well served by breeders' farms.

The work consists of making contracts with sound breeders; selecting, mating and supervising the breeding poultry; arranging the receipt of hatching-eggs; checking and packing eggs in the incubators; testing the eggs and selling the infertile eggs for table use; hatching the chicks; examining, sexing, packing and despatching the chicks; maintaining an economical but efficient advertising programme; recording and paying for eggs bought, and recording and invoicing chicks sold.

Some poultry-keepers consider that hatchery work is simple and profits immense. Both these assumptions are incorrect. The work is exacting. Profits during the months when chicks are in demand (February–May) are satisfactory, but during July–November several weeks may show a heavy loss. In order to help producer-suppliers, hatching-eggs are often paid for at contract prices, but during the months of low chick demand a high proportion of these eggs are sold at commercial egg prices, the loss being quite considerable.

There is little literature dealing with cabinet incubation, the most useful books being 'Commercial Poultry Farming', by Charles and Stuart, and 'Poultry Husbandry', by M. A. Jull. Useful information can be obtained from catalogues of manufacturers. Books on sexing are 'Sexing Day-old Chicks', by W. P. Blount, 'Chick Sexing Simplified', by R. M. Forsyth and 'A Guide to Sexing Chicks', by C. S. Gibbs.

EXHIBITING

The showing of poultry as a sole means of livelihood is impossible. The prize-money won would never exceed the

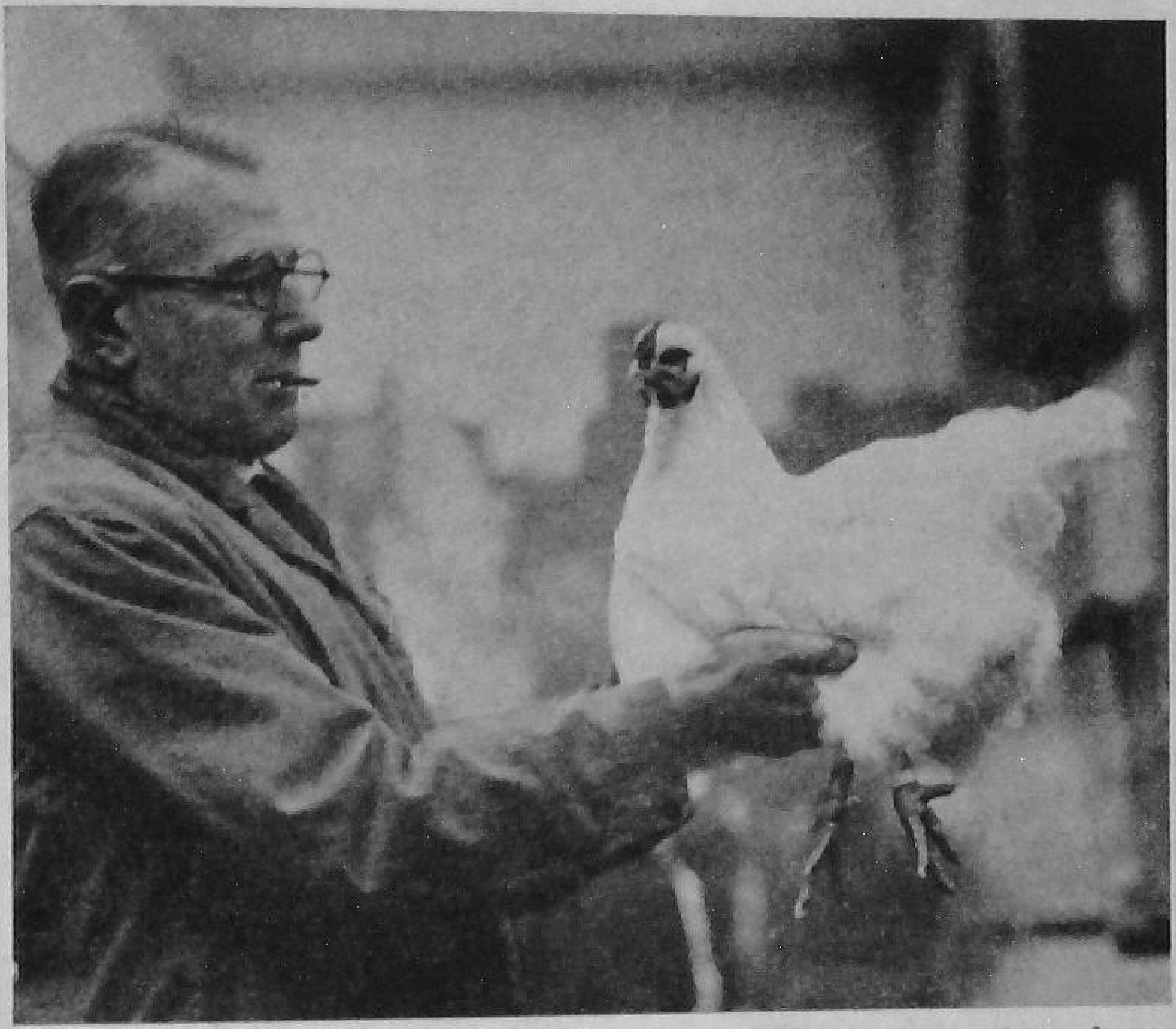


FIG. 9.—Exhibiting is an art in itself and demands an 'eye for a bird' and a flair for showing

cost of entry fees, preparation and breeding by such an amount as would leave a sufficiently large net cash profit to live on.

As a means of publicity, showing is invaluable (Fig. 9). The show-pen is the window of the poultry industry. Prospective buyers can see the exhibits, purchase at catalogue price, or meet the breeder and give an order or write the breeder for quotations.

The element of competition provides a welcome relief from the trivial round on the farm, and moreover the general improvement of breed-type and colour of stock on the farm (as one learns what is required) most definitely serves to assist sales. The birds which are representative of the standard sell more readily and at higher prices than those whose sole qualification is egg production.

While there is publicity value in sending birds to shows, it can never be of the desired use unless the birds win money prizes. One cannot expect to pick up any bird at random and walk off with the 'best in the show'.

It is advisable to keep a pen of birds of standard-bred quality which possess the size, shape, colour and markings as laid down in the official standards of the Poultry Club. Showing, even in a small way, must be run on business-like lines, and one should study the technical details. All birds intended for the show-pen require to be trained and smartened up. White or partly white birds are washed.

Birds from the show-winning strain can be used to infuse new blood into the less attractive commercial birds, and thus raise the general outward quality.

Bantams are miniatures of the large poultry. As an example, a Light Sussex hen weighs 7 lb., but a bantam hen of this breed scales only 18 oz. Bantam-keeping, although a profitable hobby, can never be regarded as a whole-time business. They are not bred for commercial egg production, though many supply the breakfast table, but they are proving a fascinating pastime when bred and exhibited.

Specialized literature on showing is: 'The Book of Standards', by the Poultry Club; 'The Show Guide', by the Poultry Club; 'Bantams and Miniature Fowl', by W. H. Silk; 'Bantams', by J. Hutton.

TURKEY PRODUCTION

This branch is concerned with the production of turkeys for the Christmas table, although very limited sales are made at Michaelmas (Fig. 10). The industry is rightly trying to popularize the 6 lb. 'week-end' turkey for popular sale right through the year. One can also become established as a turkey-breeder to sell hatching eggs, day-old turkeys, and growing stock and 'gobblers' for mating.

Only in rare instances, and then only by breeders with ample range and a particular flair for the job, is turkey production the sole means of livelihood. It is an admirable subsidiary to a smallholding or general farm where clean fresh ground can be reserved for rearing and where the growing birds can be fed cheaply on the stubbles.

FIG. 10.—Specialized turkey production with first-class stock is a profitable branch

Expenses need not be great. Specialized knowledge is necessary for hatching and rearing, but after eight weeks of age the young birds can be housed in night-arks or fold units which are moved on to any field from which crops have been removed after cutting.

Intensive turkey-rearing has been proved practicable, and thus useful for the poultry farmer proper, but accurate management and correct feeding are necessary.

Net profit one usually obtains is from 10*s*. to 20*s*. per bird.

Technical literature is: 'Turkeys' (Bulletin No. 67 of the Ministry of Agriculture); 'Turkeys and Geese', by H. Howes; 'Raising Turkeys', by M. A. Jull.

DUCK PRODUCTION

There are five branches: (1) commercial duck-egg production; (2) breeding; (3) table-duck production; (4) day-old-duckling hatching; and (5) exhibiting. Although

age, turning them in to grass until November and then fattening them up for Christmas. Goose-feathers enjoy a ready sale at high prices.

Goose literature includes: 'Ducks and Geese' (Bulletin No. 70 of the Ministry of Agriculture); 'Geese', by R. Appleyard; 'Turkeys and Geese', by H. Howes.

GUINEA-FOWL

These fowls are suitable only for a general farm or a small-holding where liberty can be afforded. They are economical feeders and good rangers. The eggs are rich, and the fowls are pleasantly 'gamey' in flavour. They cannot be considered of commercial value as the sole stock.

SUBSIDIARY ENTERPRISES

I am quite certain that it is advantageous to adopt any other type of livestock or to grow any particular type of crop which, by virtue of its peculiarities and qualities, blends in with poultry and the work connected with poultry. It is possible to obtain an extra profit from the same area of land, or to keep labour occupied in an off-season with poultry, or to provide extra food for the home. I would instance the keeping of laying poultry in a standard grass orchard a small part of which is reserved for beehives. The busy season for poultry-rearing is from February to April; for bees from May to July; for fruit-picking from July to September and for spraying from November onwards.

Another example is the keeping of goats to eat the long grass in the poultry-runs. Profitable subsidiaries are dealt with in Chapter XIII.

CHAPTER IV

CHOICE OF SYSTEMS

By the term 'system' is meant the co-ordinated arrangement of the house, equipment and run to provide conditions and afford management which are particularly effective on the proposed site and for the purpose in view.

This chapter should be studied in combination with Chapter V, on housing, and Chapter VI, on runs.

The systems are:

1. Free range.
2. Semi-intensive.
3. Intensive (loose litter).
4. Deep litter (intensive).
5. Hen-yard (intensive).
6. Fold.
7. Battery.

FREE RANGE

Description. Under this method the poultry are allowed free range, meaning that they can wander at will over the allotted meadow or field and are not controlled by wire-netting fences (Fig. 13). Actually poultry rarely range more than a hundred yards from their house. There is no question, therefore, that they will escape and be lost.

Adaptation. It is particularly suitable for those who possess or intend to possess a farm or smallholding on which land can be set aside (permanently or temporarily) for wide-range poultry-keeping. Two hundred fowls can be allowed

for on each acre, but this number may be varied, being greater if the houses are moved frequently and fewer if the grass or crop (for example, clover) is to be encouraged.

House Type. The houses may be stationary, to hold 50–200 birds (allowing 3 sq. ft. of solid floor area per bird), or portable, to hold 20–50 birds (allowing $\frac{3}{4}$ sq. ft. of slatted floor area per bird).

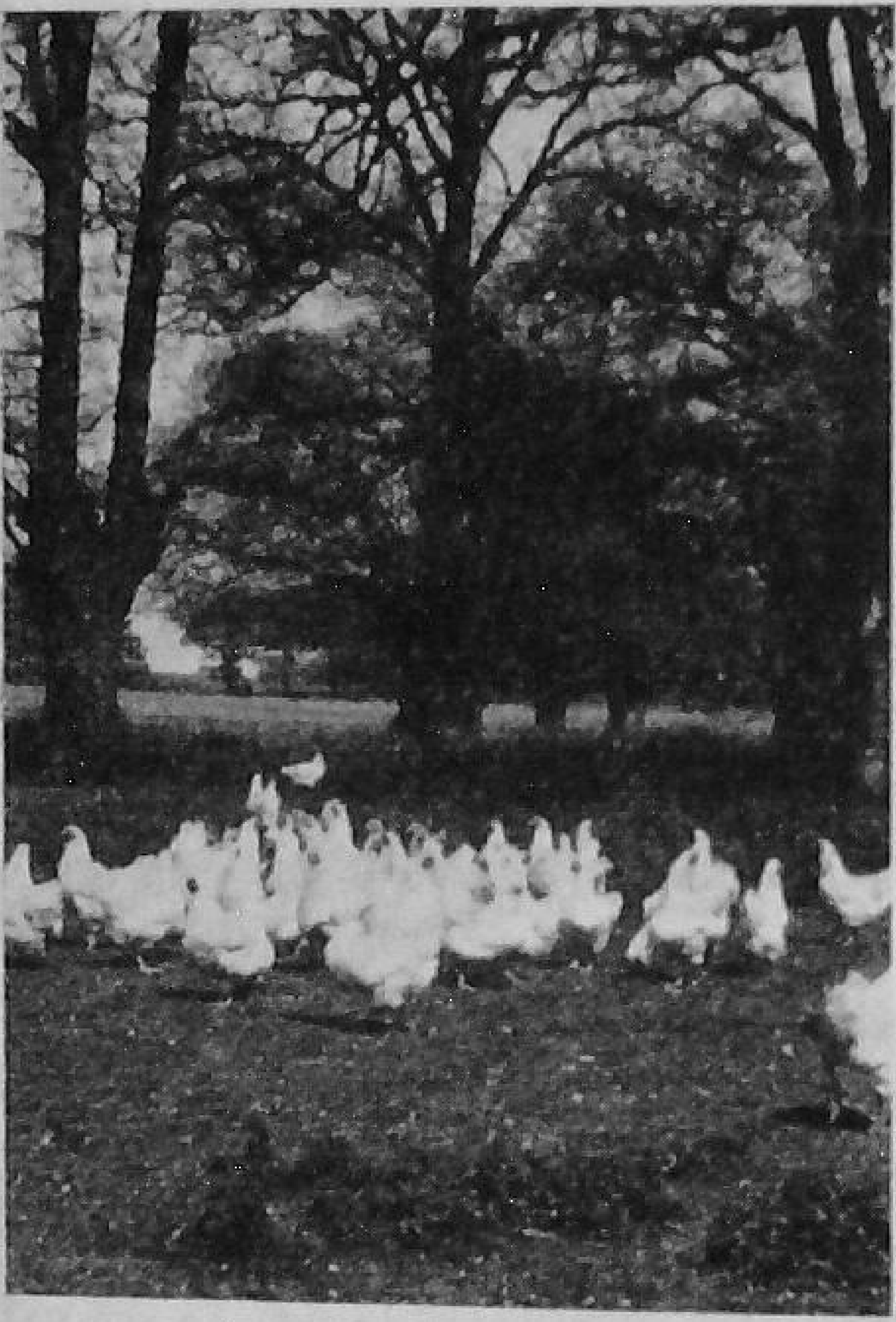


FIG. 13.—Free range under natural conditions will never be completely eclipsed by mechanical intensive methods

The stationary house is usually established in the centre of the meadow (grass field), and the birds radiate from it to the field boundaries. To feed off grass that reaches a length (4 in. or more) at which poultry cannot make good use of it, sheep or cows are used.

The disadvantages of the stationary house are that the area near the house becomes denuded of grass and must be kept sweet, and that the land is not evenly grazed or manured. The advantage is that labour is saved where the house is large, and that in the winter the layers can be kept confined, dry, protected, comfortable and in heavy production.

The portable house may be of two designs: (*a*) the old-fashioned, dark, solid-floored house on wheels, which should have been scrapped years ago, and (*b*) the modern

slatted-floored building on wheels or skids. Where birds are to be allowed free range, this type is excellent; but to obtain full advantage it must be frequently moved, in order to ensure the same rate of grass consumption over the whole area, to prevent worn foul areas and to make certain that the droppings are evenly distributed, without the necessity of scraping droppings-boards and carting the manure.

Another advantage is that the poultry can be moved on to and off any crop which will provide free food. I would mention cut clover or sainfoin or lucerne, and cut market cabbage or kale. Use should also be made of fallow, newly ploughed soil and stubbles, from which the poultry will collect and destroy numerous pests.

The common method of allowing fowls the run of the farm-yard is really the free-range system, and is valuable, in that much useful food spilled from the threshing, etc., is gleaned.

Type of poultry. This system is particularly suited for flocks of layers, ; but by the use of smaller unit houses it can be used for flock breeders, surplus young cockerels, laying-ducks, growing turkeys and goslings.

Advantages. (1) maintenance of clean ground, thereby decreasing risk of disease; (2) reduction in capital outlay and renewal, as wire-netting and posts are unnecessary; (3) poultry obtain free food; (4) the cost of housing per bird is less than on other systems; (5) the soil is fertilized free and the food value of the grass for other stock much enhanced; (6) farming operations are not interfered with.

Disadvantages. (1) Losses may be serious in districts where foxes abound; (2) wild birds may devour much food and tend to bring disease, unless preventive measures are taken; (3) eggs are lost when laid away in hedgerows, unless special encouragement is given the birds to lay in their nests; and (4) impossible of adoption unless ample land is available.

SEMI-INTENSIVE

Description. The poultry are provided with a house and a limited grass run, bounded by wire-netting. In bad weather they can be confined to their house, which is well lighted and dry, and in pleasant weather allowed out in the run.

Adaptation. This is the recommended outdoor system for layers where the area of land is restricted, and was the most popular method on poultry farms before the war. It is also valuable for controlling breeding stock, even where there is ample acreage. As few as six birds can be kept in a pen or as many as 200. Two hundred layers can be kept on one acre of land, allowing 200 sq. ft. of grass area per bird. This number may be increased if the soil naturally grows good grass and if the herbage is cared for. An economical limit for layers is 150 birds, with a minimum of 100 birds and a maximum of 200 birds per house.

House type. There is only one which is completely satisfactory, and that is the stationary, semi-intensive, solid-floored house, which is of rather elaborate design, to ensure complete comfort for the birds on bad days. It must be fitted with some glass windows and possess an efficient system of ventilation. It must keep out wind and rain and be fitted with the correct furniture inside. It should preferably have a wooden floor raised 10 in. at least above the ground. Droppings-boards must be fitted 8 in. beneath the perches.

The layer capacity is judged by floor area, allowing 3 sq. ft. per bird, but better 4 sq. ft. per bird for breeders or where layers are to be frequently confined. (See also the Hen-yard and Deep-litter Systems.)

Slatted-floored houses have been used in limited runs, but I consider their place is on a farm or on wide range, where they can be moved. They are useful in an emergency and

for housing growing pullets or cockerels, to make use of the grass of a temporarily empty run. Where a slatted-floored house is used, 250 sq. ft. of grass area is necessary to ensure maintenance of good grass, and it is wise to move the house within the run.

The limited runs in order of popularity can be of (*a*) permanent grass always in use; (*b*) permanent grass with double runs used alternately; (*c*) cultivated crops for feeding off to the laying-fowls; (*d*) earth (not recommended except in a back garden, which does not concern us). The merits of each are described in Chapter VI, on runs.

Type of poultry. This system is suitable for practically all varieties and ages of poultry, because house and run can be of a size convenient for the purpose required. It can be used for layers, breeding-pens and growing birds, of fowls, ducks, geese and turkeys.

Advantages. (1) Complete control; (2) indispensable for small-pen breeding and pedigree work; (3) ability to use the same houses and runs for different purposes throughout the year—for example, young pullets as layers, and yearlings as breeders; (4) economical use of available land; (5) high winter egg yield maintained by confinement during bad weather and by electric lighting from October to January to provide an extra night feed and gland stimulation.

Disadvantages. (1) High cost of fencing and gates; (2) need for the prevention of foul ground and worn grass; (3) danger of over-stocking.

INTENSIVE (LOOSE LITTER)

Description. Poultry are said to be kept intensively when they are permanently confined to their house, which may or may not be provided with small wire-netting-floored sun-parlours, into which the birds may enter to obtain the benefits of fresh air and sunlight. No outside run on to

earth is allowed. The birds eat, exercise, sleep and lay in one room, as it were.

Adaptation. Some form of the intensive system (loose litter, deep litter, hen-yard or battery) is necessary for maximum winter egg production. It is of value for housing laying-fowls where land is scarce or where it is required for other livestock purposes, such as for semi-intensive breeding-pens. Each light breed requires a minimum of 3 sq. ft., and each heavy breed 4 sq. ft. of house floor-space, and a building 50 ft. long and 12 ft. deep will house 150–200 birds, which is a convenient unit. Allowing for alley-ways between the houses, it will be seen that no fewer than 5,000 layers can be kept on one acre.

Intensive laying on a large scale was not popular in pre-war days because of the difficulty in feeding efficiently to maintain a satisfactory egg yield and robust health, and in controlling outbreak of vices, but with our extended knowledge of nutrition intensive production with maintained health is now common.

It is excellent where layers are to be kept on a limited area or where a top floor of a farm barn is to be turned to good use as a laying shed.

House type. It is essential that a house designed specially for this work only should be used. It must provide the inmates with the exact conditions required for health and production, and it must be fitted up inside with furniture which is labour-saving and efficient (see Chapter V on housing). The floor is covered with light loose dry litter in which the birds scratch for exercise and which is renewed when it becomes damp.

Type of poultry. Although primarily designed for heavy-laying fowls, smaller units have been successful for brooding chicks and turkey chicks in the early months of the year. It is not satisfactory for laying or breeding ducks, geese or

turkeys, but good for rearing and fattening. No poultry kept intensively should be used for breeding at a later date until conclusive experiments prove the method whereby health and vigour are not impaired.

Advantages. (1) Minimum area of land required; (2) all work is done under cover; (3) observation and culling are easily carried out; (4) protection is afforded from soil-borne diseases; (5) the birds are able to exercise vigorously; (6) eggs are kept clean and none is lost; (7) winter egg yield is high; (8) the manure retains its full fertilizing value.

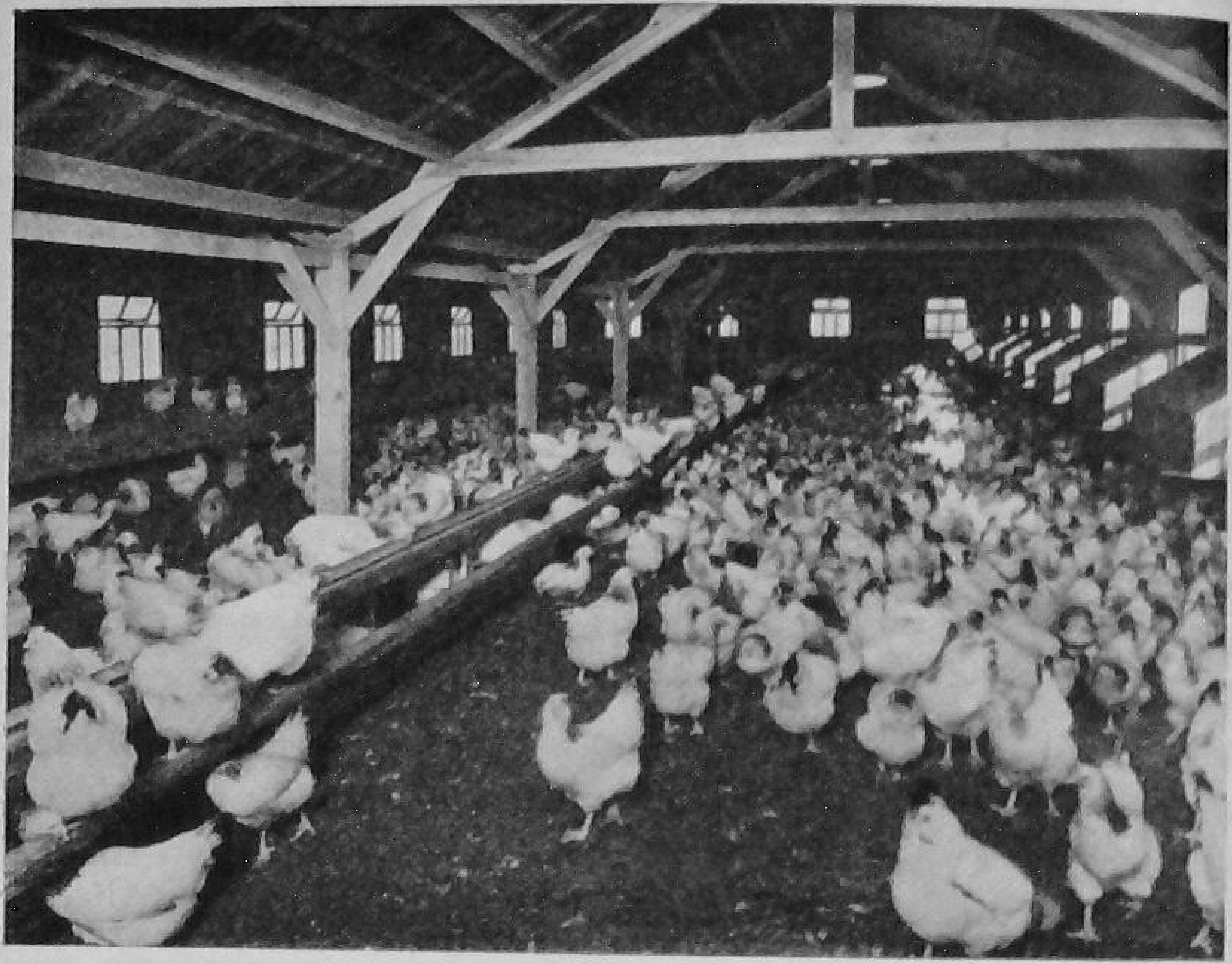
Disadvantages. (1) Difficulty in preventing loss of essential strength and vigour; (2) likelihood of outbreak of vices, such as feather-picking; (3) rather high expenditure of labour to maintain absolute cleanliness and litter-changing, and (4) inability of the fowls to make good food deficiencies by ranging.

Literature. 'The Intensive System of Poultry-keeping', by Heale and Reddaway.

DEEP LITTER (INTENSIVE)

Description. Sometimes called 'built-up litter' (Fig. 14). This is a new development of the loose-litter intensive system (which see), and is the same except that the litter remains unchanged, but is so controlled that bacterial decomposition liberates ammonia, produces heat and makes the litter dry and friable, as well as forming vitamin B12. The poultry are not allowed outside.

Adaptation. Popular because of the ability to keep winter layers well protected and managed for a low labour cost. Useful where the land available is to be used for other purposes and the minimum area allowed for the poultry. Light breeds require 3 sq. ft. and heavy breeds 4 sq. ft. of floor area each. If a wire-floored sun-parlour or veranda is



[Thornber Bros. Ltd., Mytholmroyd, Yorks.

FIG. 14.—The deep-litter system
Successful deep-litter house with Light Sussex layers

fitted along the outside of the front, then ½ sq. ft. per bird can be saved.

House type. This is of the fully intensive type, with an absolutely dry floor, raised, if of wood, at least 9 in. above the soil, or of concrete with damp course. Earth encourages rats, and is to be avoided.

The walls should provide good insulation, and hence this system is popular for converting farm buildings with thick walls. Ventilation is vital, and must be low down (inlet) and high up (outlet), to allow six air-changes per hour.

The best litter is a mixture of two or more of the following: peat moss, cut straw (1 in. length), shavings and sawdust in equal parts put in when quite dry at a depth of 6–9 in., and preferably starting in August or any other dry month.

When it becomes damp it is sprinkled with hydrated lime,

and new litter added and turned over. The whole idea is to start the litter 'working' and to keep it 'working'.

Type of poultry. Primarily for layers in units of 150–500 birds, and I would certainly advise first crosses. Can also be used for chick-rearing and growers.

Advantages. (1) Economy of space (500 layers on 1,750 sq. ft. or an area 24 yds. by 8 yds. approx.); (2) management done under cover; (3) no cleaning out; (4) saving of labour (three hours per day per 1,000 layers); (5) eggs are kept clean and none is laid away; (6) winter production high because of protection; (7) provides vitamin B12 (and thus reduces the need for animal protein); (8) the litter after a year makes excellent plant fertilizer; (9) suitability for farm-building conversion.

Disadvantages. (1) Litter requires skilful control and management; (2) high cost of housing compared with an outdoor type; (3) some risk of disease spread because of dusty atmosphere and close confinement; (4) smell of

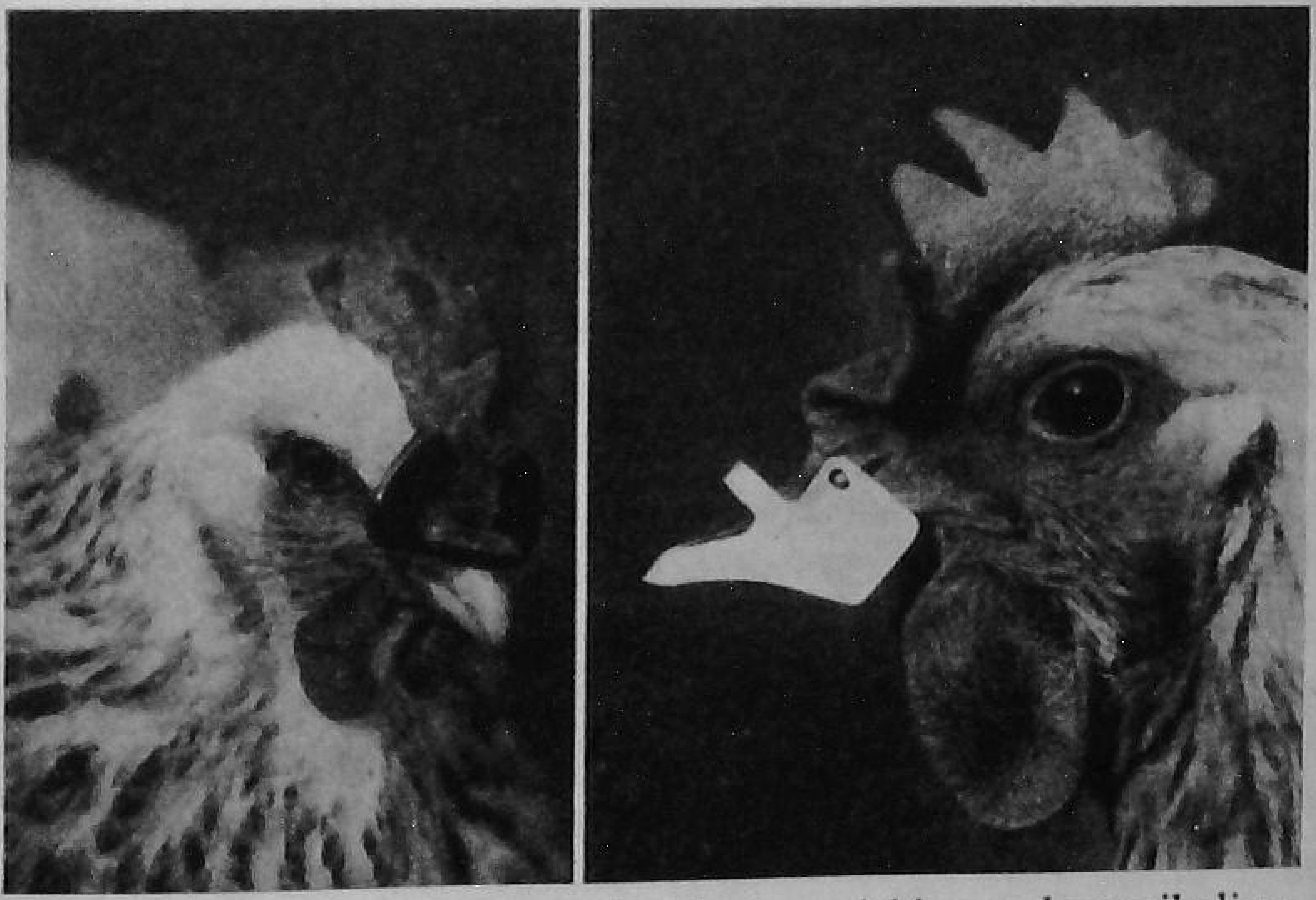


FIG. 15.—Methods of preventing feather-picking and cannibalism
Left, beak spectacles; right, beak visor

ammonia (natural, though sometimes annoying); (5) chance of trouble from feather-picking and cannibalism (hen spectacles may need fitting (Fig. 15)).

Literature. 'Deep Litter', by Thornber and Hale (*Poultry World*); 'Deep Litter', leaflets of B.O.C.M., Silcocks, Crosfields and others.

HEN-YARD (INTENSIVE)

Description. A 'hen-yard' consists of (*a*) a building (new or converted) where the layers eat, sleep, exercise and lay, and (*b*) a yard or run attached where they enjoy fresh air, direct sunlight, exercise and certain types of food.

Adaptation. This system has three variations: (1) it is of particular value for layers on a farm where out-of-use buildings can be converted into intensive-type winter laying-houses which have a yard at hand; (2) it enables layers to be housed with a minimum capital outlay—for instance, using straw bales, and (3) it reduces the prime house cost for deep-litter work, as it permits 2–2½ sq. ft. per bird floor area, as against 3–4 sq. ft. where no outside run is provided.

House type. This should be of an intensive design, to provide complete wind and rain protection, with ample light, sufficient draught-free ventilation, absolute dryness and full comfort. With efficient internal furniture it is therefore possible to keep the birds confined during periods of bad weather. Deep litter can be used.

The yard allows 4 sq. ft. per bird, and is well littered with straw, fresh being added each week as necessary, so that often after twelve months the depth may be 2–3 ft., much having decomposed to form a valuable organic fertilizer.

Type of poultry. Primarily for layers, but with adequate feeding can be used for breeders. Fowls and turkeys can easily be adapted, and so can ducks, provided specialized attention is given.

Advantages. (1) Ability to adapt farm buildings; (2) low labour charges; (3) economy of area (total 6 sq. ft. per bird); (4) comparatively low capital cost, even with new building; (5) avoidance of disease from foul ground.

Disadvantages. (1) Risk of rat infestation; (2) need for adequate drainage; (3) protection for lower 2½–3 ft. of run is advisable; (4) chance of red-mite infestation; (5) easy spread of infectious disease.

Literature. 'The Henyard' by G. Sykes (Crosby Lockwood); 'Hen-Yards' in B.O.C.M. leaflet.

FOLD

Description. The fowls are kept in 'fold units', consisting of a small, low house with permanently attached run, and which is capable of being readily moved (Fig. 16). The fowls are never allowed outside the run.

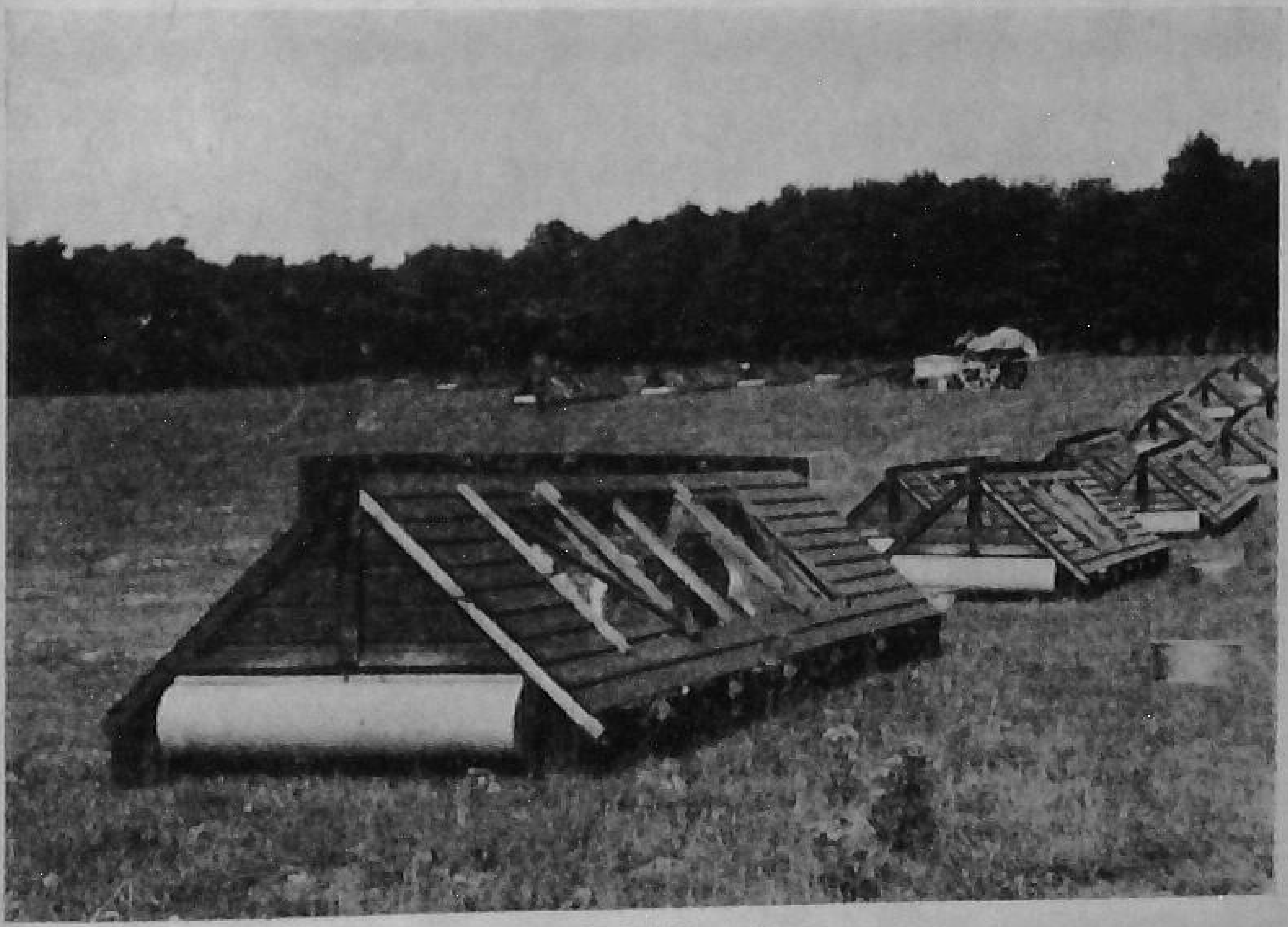


FIG. 16.—A fold unit system

This is of special value where land is to be covered with poultry in an exact and controlled manner.

Adaptation. It is a system possessing advantages which have not yet been fully appreciated. It can be used on any type of soil or upon any crop, for example, grass, stubble and lucerne. It *must* be moved, so that the birds are always upon fresh sweet soil and can obtain a part of their food from the crop enclosed by the run.

The popular mode of use is to set up a row of fold units and to move them frequently and in line across the field. Thus the crop is evenly eaten, the soil is not fouled and the droppings are evenly distributed.

Fold units are never allowed to remain unmoved. Thus if a given meadow were to be permanently devoted to poultry in fold units, 300 birds could be kept on one acre.

House type. The house part has a slatted floor, nest-boxes, and often built-in mash and water-troughs and broody cage. The capacity is decided by slatted-floor area allowing $\frac{3}{4}$ sq. ft. per bird. The attached run is no more than $2\frac{1}{2}$ ft. high, covered with wire-netting, and provides up to 4 sq. ft. of soil area per bird.

Type of poultry. Expertly used, the fold unit can house successfully all types and all ages of poultry. In order of value, it can be adopted for laying-fowls or ducks, breeding-fowls, growing stock of all types and brooding all varieties of young stock.

Advantages. (1) Complete control; (2) maintenance of fresh soil; (3) freedom from overstocking of land; (4) enables the poultry to obtain free food; (5) destruction of harmful crop pests; (6) even distribution of droppings, with surprising improvements in soil fertility; (7) protection from foxes and vermin.

Disadvantages. (1) Necessity for moving the units frequently (and some makes are difficult to move); (2) rather high expenditure of labour in feeding, cleaning and

egg collecting; (3) inability to provide real comfort during bad weather.

BATTERY

Description. Laying fowls are confined in batteries of cages holding one bird each (occasionally two birds), the batteries being housed in a specially constructed building to provide the exact conditions necessary. The birds are never allowed out, and should not be used for breeding until our present knowledge of nutrition assures us of no deterioration. Batteries of a special type are also used for chick-brooding, rearing and for fattening.

Adaptation. This is the 'mechanized' system of housing laying-stock. Frankly, I consider that where maximum egg production is the sole aim, particularly in winter, the best commercial method of housing the layers is in batteries; morever, the best birds are first crosses, not pure breeds.

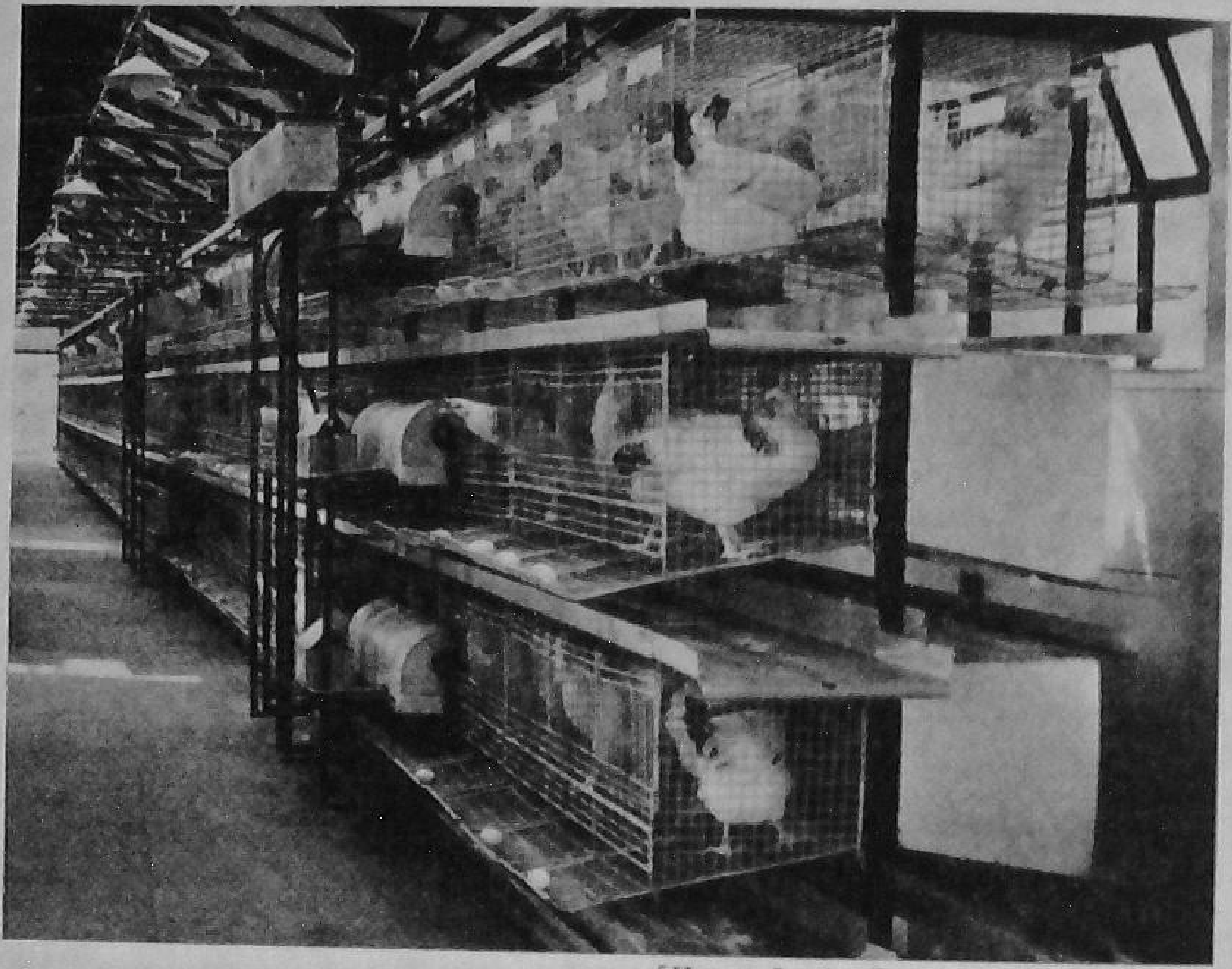
The unit may be as small as twelve birds or as many as 1,000 birds in one house. To hold twelve birds, the floor area is only 5 ft. long by 4½ ft. wide; to hold 1,000 only 120 ft. by 18 ft.

There are three types: (*a*) manually cleaned and operated; (*b*) semi-automatically cleaned and (*c*) self-cleaning and self-feeding cafetaria (Fig. 17).

House type. The house must naturally be strongly built, with a wooden floor raised 12 in. above the ground, and it must be designed to allow of free ventilation without draughts, to admit sunlight but exclude rain and wind, to keep completely dry and to provide ample room for feeding and management (see Chapter V, on housing).

The batteries of cages are installed to provide alley-ways.

There are types of batteries made for outdoor use, and a house is then unnecessary, but in my opinion they are not of commercial value.



[Harvey Laying Battery Co. Ltd., Colchester

FIG. 17.—A fully automatic cafeteria laying battery requiring the minimum of labour

Type of poultry. Batteries have proved highly successful for laying-fowls, but scarcely so valuable for chick-rearing, probably because of the difficulty in providing a ration complete in every respect. They are not practicable for laying-ducks, geese or turkeys, and should not be used for housing any future breeding-stock until our knowledge of nutrition is sufficiently advanced to allow for breeding without deterioration.

Advantages. (1) Feeding and management are carried out under cover; (2) food is protected from thieving vermin and birds; (3) soil-borne diseases are avoided; (4) outbreaks of disease are prevented from spreading; (5) the minimum area of land is required; (6) cleaning out is mechanical and rapid; (7) unprofitable layers are quickly identified; (8) eggs are kept clean and washing is avoided; (9) insect pests

are easily controlled; (10) vices are impossible (except where more than one bird is kept in one cage); (11) broody coops are unnecessary; (12) when their laying life is over, the birds are soft of flesh and make excellent table birds.

Disadvantages. (1) High cost of installation; (2) inability to use the birds as future breeders; (3) scrupulous attention must be given to feeding scientifically correctly.

The R.S.P.C.A. has given a considered verdict that it is in no way cruel to keep birds closely confined in cages. Actually the fowls are most comfortable and happy.

Literature. 'Hen Batteries', by W. P. Blount; 'Battery Egg Production', by L. Robinson.

CHAPTER V

HOUSING

THE novice, and indeed the expert, is often perplexed in regard to purchase of a poultry-house for a particular purpose. His confusion is aggravated by study of a manufacturer's catalogue and by a visit to a trade stand. So many types are on offer and so plausible are the persuasive powers of the salesman that an unsuitable choice is not unlikely.

My aim is to endeavour to explain the matter frankly, and thus advise the beginner against purchasing a building which will be discarded later.

ESSENTIAL REQUIREMENTS

Satisfactory service is assured only from a house which possesses these qualities :

1. Constructed of strong framing and stout materials.
2. Efficient for the specific purpose to which it will be put.
3. Adequately ventilated.
4. Providing complete protection from all weather excesses and vermin.
5. Permitting the admission of light and direct sunlight in controlled quantities.
6. Sufficiently large to house the projected number of birds of the ages desired.
7. Provided with interior fitments; simple and efficient, to make labour economical.

8. Purchased at a price which offers good value for money.

A house is unsatisfactory : (1) if it is cheaply made, for it will need constant repair and renewals; (2) if the design is such that the poultry in it are at any time uncomfortable—losses will occur; (3) if it allows accumulation of foul air or is swept by draughts, for the birds will suffer from colds and allied diseases and results will be disappointing; (4) if it permits the admission of rain or heavy wind, for health will be poor and labour costs increased; (5) if it either excludes sunlight or allows an excess, for general well-being will be ruined; (6) if it is too small and is overcrowded, for disease will be rampant and stamina reduced; (7) if it is provided with unnecessarily complicated fitments inside or is devoid of a useful article, for management will be wasteful; (8) if it is so expensive that the capital charge is excessive, for the gross return of profit will be reduced.

N.B.—*All* the essential qualities must be present. A house perfect in all ways, but badly designed at the front, is as worthless as a building which can be faulted in many directions.

The requirements appear considerable; but it is by no means difficult to find houses possessing all the attributes; indeed, one must obtain specifications and quotations until such houses are found.

Now let us consider the requirements in detail.

1. CONSTRUCTION

The materials available are timber, asbestos, metal, plastics, cement, brick, straw and felt netting.

Timber. The popular and cheap variety is red deal. This is excellent if well seasoned, straight grained and free from knots. I would definitely advise the use of wood which is pressure-creosoted or pickled, for then constantly recurring preservation treatment is obviated and much labour

saved. For skids or bearers which are to rest upon the soil, then, I suggest pressure creosoted timber given two coats of a boiling mixture of tar 9 parts and pitch 1 part, or soaked in copper naphthenate solution (Cuprinol). The alternative is the use of oak for these parts.

Red cedar-wood is excellent, in that it contains its own preservative oil, and therefore has a much longer life than deal. Manufacturers claim that it does not need preserving, but I should prefer to creosote or paint it.

Although the popular type of board is the vertical tongued-and-grooved *V*-jointed matching, the better pattern is the horizontal shiplap weatherboard, because the joints are not so liable to deteriorate. Two types which are not satisfactory are the ordinary weatherboard and the plain square-edged board.

Resin-bonded plywood increases in popularity, claiming to be weather-proof, draught-proof, shrink-proof and tough, though light. It neither warps nor splits. The surface exposed to the weather needs no preservation, although some preservative solution or coloured bituminous paint is recommended.

Asbestos. This is an excellent material, of which greater use might be made. It has excellent insulating properties, requires no preserving and looks clean and tidy. Its one fault is its brittleness, but ordinary care ensures against damage. It can be bought flat, corrugated or patterned.

Metal. Neither flat nor corrugated iron is satisfactory, because houses so built are cold in winter and excessively hot in summer. It is, however, an excellent material for roofing, provided it is laid over a wooden roof, which prevents condensation of moisture into the house below. Open-fronted scratching- or shelter-sheds can be made of corrugated iron, as can the food-store.

Much use is being made of aluminium-coated alloys,

which are both tough and light, particularly where minimum weight is required, as in fold units, outdoor brooders and movable houses.

Plastics. Houses of synthetic materials will come, for they will offer freedom from deterioration, ease of cleaning and lightness. However, one must not be led into purchasing buildings of such materials until one is satisfied that fracture is unlikely and until the price and life are in line with that of more common materials.

Cement and bricks. I have seen poultry-houses made of cement blocks, 4½-in. bricks and breeze blocks. Although they are weatherproof and provide excellent insulation, they are costly to construct and impossible to move. They are most suitable for the office and food-store.

Straw. This is thatched on to wire-netting stretched on stout posts. Results have been excellent; but the drawbacks, as I see them, are the difficulty in controlling insect pests, the encouragement given to vermin and the need for renewal after a period of five years.

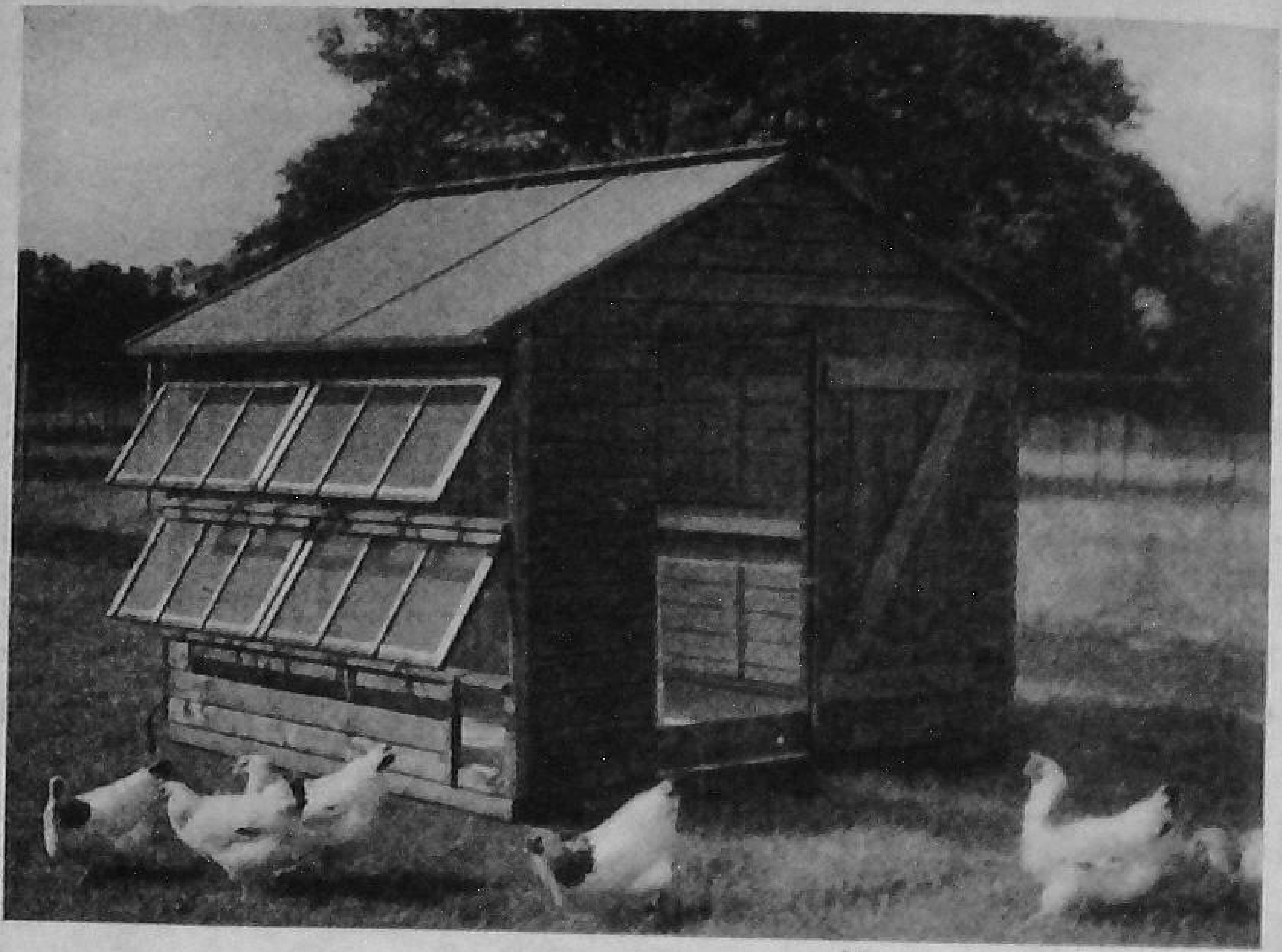
Good use has been made of compressed-straw bales built up on one another to provide a shelter and hen-yard for layers. Bales are also of particular value for hen-yard walls, to act as wind-breaks and give shelter.

Felt and netting. As a temporary expedient this appeals, but I should not entertain it. The house is constructed of the usual framing, over which wire-netting is tightly stretched and covered outside with stout roofing felt. It is satisfactory for a light, easily moved roosting shelter or range.

2. SPECIFIC PURPOSES

According to the purpose for which the house will be used, so the design must be selected.

Multi-purpose. Let us consider this first, because any house which is out of use for any part of the year is not



[Boulton & Paul Ltd., Norwich

FIG. 18.—A multi-purpose house

A popular combination house of modern design for brooding or laying (7 ft. × 7 ft. × 6½ ft.)

earning as much profit as it should and is reducing the net profits by depreciation. A multi-purpose house is one which, by virtue of its design, can be efficiently used for more than one type or age of stock (Fig. 18).

Examples are: (1) a semi-intensive, solid-floored house to be used as a breeding-pen from January to April and thereafter as a growing-on house with a duplicate run, or for fattening surplus cockerels; (2) a brooder-house in use from January to April to be later devoted to fattening up to August, and thereafter for laying; (3) a slatted-floored night ark fitted with nests for housing growers from May to August and then used as a breeding-pen to supply eggs for hatching for Spring chickens; (4) a slatted-floored laying-house for growers on stubble or free range from May to August, to be followed by young pullets for winter laying.

The efficient poultry farmer keeps his houses and appliances in use as long as possible; but it is important to ensure complete disinfection between any change-over and to avoid over-stocking of the soil.

For chicks. Brooding can be carried out in houses of these types: (1) indoors in a semi-intensive-type house on a solid floor; (2) outdoors in specially designed self-contained brooders; (3) in battery brooders (cages in a house). To avoid repetition, the reader is referred to Chapter XI.

For growers. The finest house for growers is that with a slatted wooden or wire-netting floor through which air movement is permitted. The most popular type is the small ark, but other suitable houses are the fold unit and the slatted-floored laying-house (these two latter being brought into operation when not required for breeders or layers). Points about an ark are: at least 12 in. of vertical side; a floor which is removable; ample ridge ventilation; stout legs 6 in. high; door on the slope and pop-hole at the end.

The solid-floored house for growers is not economical and allows of crowding and suffocation. If it *must* be used, then a slatted or wire-netting platform should be placed on the solid floor, or perches should be provided.

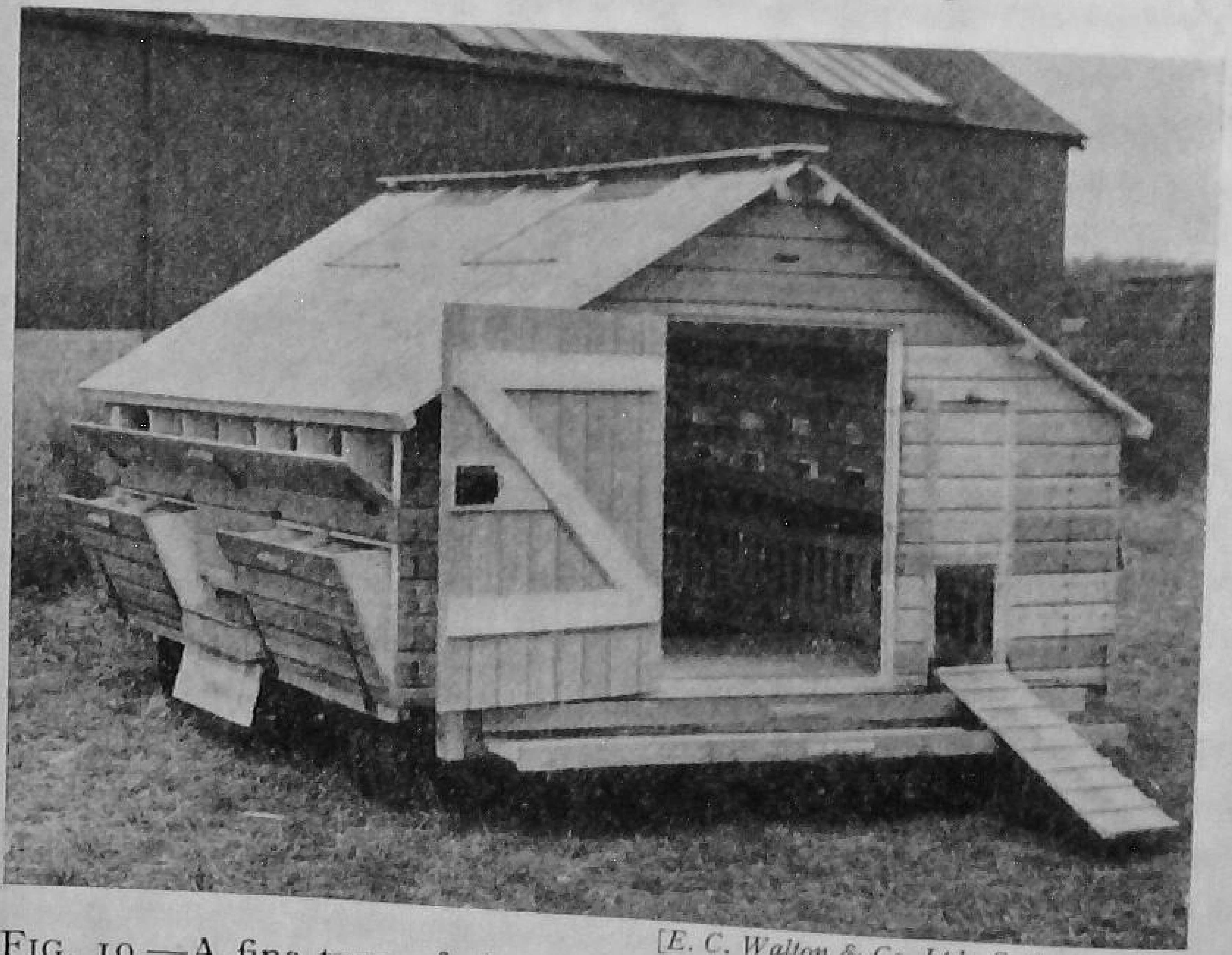
For layers. The type of house chosen will depend on the system to be operated (see Chapter 4).

Area Available	*Design of House to Choose*
Free farm range.	Movable slatted-floored on wheels or skids, or movable fold unit.
Grass range.	Fixed solid-floored semi-intensive or movable slatted-floored or movable fold unit.
Grass orchards.	Ditto
Small restricted area.	Intensive solid-floored house (fixed) (loose or deep litter) or battery cages.
Farm-yard.	Deep litter or hen-yard.

N.B.—Where ample land is available, it may be advisable to house intensively and to use the land for growing feeding-stuffs. For winter eggs the use of an intensive system is vital.

A slatted-floored or field house has a span roof (the sides being mid-way between back and front); a floor of wooden slats $\frac{3}{4}$ in. wide and $\frac{3}{4}$ in. apart; a sliding droppings-board 12 in. beneath the slats (this is sometimes omitted); nest-boxes above the slats (these nests have to be shut every night to prevent birds sleeping in them); a slatted broody coop in the roof (this may be omitted); built-in dry mash-boxes (not always present) and is built on skids or wheels to allow of movement by the aid of a horse or tractor (Fig. 19). A suitable size is 8 ft. by 6 ft. by 7 ft. to ridge, and this will hold fifty layers, allowing at least $\frac{3}{4}$ sq. ft. per bird.

Important essentials are: strong under-carriage and hard-wood skids or wide-tyred iron wheels (at least 4 in.); easily removed slatted floor and droppings-boards for cleaning; glass in roof or sides for interior comfort; ample ventilation



[*E. C. Walton & Co. Ltd., Sutton-on-Trent*

FIG. 19.—A fine type of slatted-floored laying house with every modern convenience (10 ft. × 7 ft.) for about 100 layers

at ridge-board; doors and flaps made to allow for expansion when wet; eggs collected and nest-fronts adjusted from outside the house; rounded or chamfered slats.

A fold unit consists of a small slatted or wire-floored sleeping-shed (with droppings-boards and nest-boxes), to which is permanently and rigidly fixed a run, covered top and sides with wire- or chain-link netting (the latter preferred where larger live-stock range round the houses). The unit, if small, is fitted with central fulcrum points to allow of movement laterally, or with a pair of handles at each end, to permit of lifting; or, if large, with wheels and handles, or with an iron collar and staff for levering.

A convenient size is 17 ft. × 5 ft. × 4 ft. high, the house part being 4 ft. × 5 ft. and the run 13 ft. × 5. ft. The capacity is determined by slatted-floor area, in this example being 20 sq. ft. and housing sixteen layers, allowing rather more than $\frac{3}{4}$ sq. ft. per bird.

Points to note when inspecting are: strength and rigidity of framework; ease of movement, small units preferably single-handed; convenience in cleaning out, egg-collecting and feeding; rounded or chamfered slats; doors in run; practical worth of the design in the field (which may be unlevel or hilly).

A semi-intensive house is actually a solid-floored house of a particular design to provide complete comfort for the birds during any type of weather. Small sizes up to 8 ft. deep may be of the lean-to pattern, but deeper houses are more efficiently ventilated if of (*a*) the three-quarter or two-thirds span pattern—that is, in which the ridge is the highest point and the roof falls away to the back and front, the front fall being the shorter—or of (*b*) the equal span (or cabin) pattern, in which the ridge is midway between the house front and back.

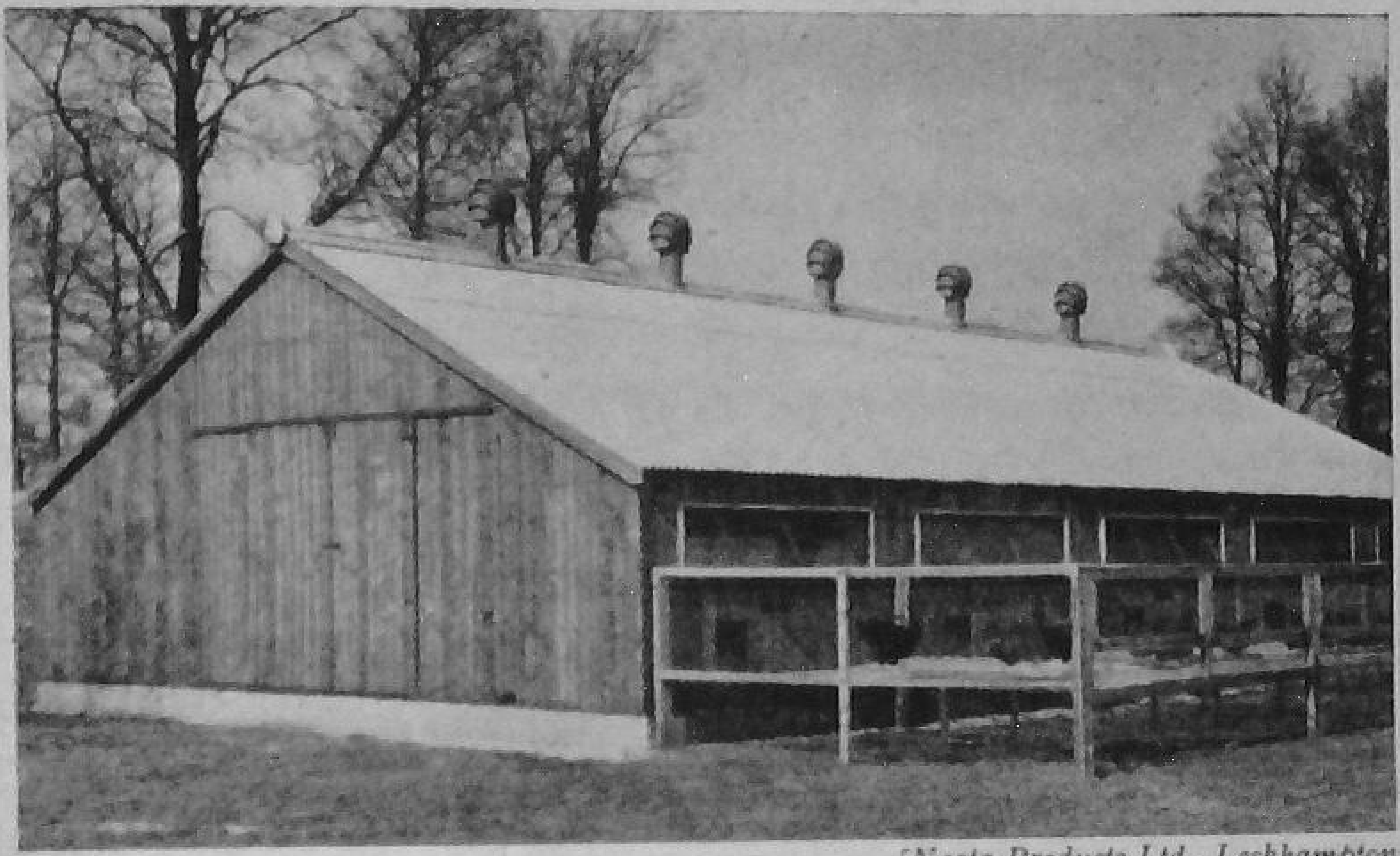
The front facing south is of rather elaborate design, half

to two-thirds the area consisting of glass windows and shutters adjustable for ventilation and shade. The nests are fitted along the front or the sides or on table platforms inside; the perches are made parallel to the back wall and fitted with droppings-boards 9 in. beneath. The floor is littered for cleanliness and exercise. A useful size for fifty layers is 20 ft. × 10 ft., allowing a minimum of 4 sq. ft. of floor area per bird.

Points to note are: stout, strong floor, which must be raised 12 in. above the soil, to prevent rat infestation; windows and shutters easy of adjustment and able to provide the interior with the exact quantities of sun, shade and air; the provision of low windows to light the floor; adequate nests (one for each four birds); perches on metal mite-proof sockets; easily removed droppings-boards covered with galvanized sheet-metal; really sound roof and thoroughly efficient inside fitments (p. 90).

N.B.—The semi-intensive house is usually immovable, but for the smaller sizes—that is, up to 12 ft. × 6 ft.—I strongly recommend the fitting of 4-in.-wide wheels, or skids and towing rings, so that the house can be frequently moved, in order to prevent fouling of ground and the wearing of grass round the door and pop-holes.

An intensive (*loose-litter*) *house* is similar to the semi-intensive type, except that, as the birds are always confined to it, it must be capable of providing conditions of complete perfection. It must permit the admission of direct sun-rays, so that the birds can sun-bathe. This is provided for by drop-down or slide-up windows to expose open wire-netting. An alternative plan which I favour is to fix sun-parlours along the whole front of the house (Fig. 20). A sun-parlour (or balcony) is a fixed run on legs, covered top, sides and bottom with wire-netting. An excellent size is 8–10 ft. deep, 30 in. high and as long as the house.



[Neata Products Ltd., Leckhampton

FIG. 20.—An intensive house with sun-parlours (or verandas) fitted along the front

For other particulars and essentials, refer to the description of the semi-intensive house above. It is preferable, however, to allow at least 4½ sq. ft. per bird of floor area.

A deep-litter house follows the same design as the intensive, with these important features: (1) raised wooden or rat-proof concrete floor; (2) thick walls, to provide good insulation and keep 50–70° F. temperature; (3) roof maximum of 7 ft. and insulated, with straw or false ceiling; (4) gentle adequate ventilation (both low and high) to allow five to six air-changes per hour; (5) less glass-window space than in battery houses.

It should allow 3 sq. ft. for each light breed and 4 sq. ft. for each heavy breed, with ½ sq. ft. less if a sun-parlour is used outside.

A hen-yard house is of the intensive type for loose litter and of the deep-litter design and features for built-up litter, allowing 2 sq. ft. per bird. It is often a converted farm-building making use of the stock-yard, suitably fenced, or an existing intensive house properly altered for deep litter, to

[Thornber Bros. Ltd., Mytholmroyd, Yorks.

FIG. 21.—A Dutch barn converted into a deep-litter house

which is added a yard of cement raft or rammed, well-drained earth at 4 sq. ft. per bird.

A battery house is a building capable of providing light, sunshine, shade and air, in which are housed individual wire cages built up into batteries, and in which the layers live permanently (Fig. 21). Actually the house is on the lines of the wooden Army hut.

Important essentials—of a span design with automatic air-extractor ventilators at the top and with controlled air inlets low down near the floor; fully and evenly lighted (sides and roof), but capable of being shaded in hot weather; substantial construction, as befits a large building; thoroughly trouble-free roof (suggest corrugated asbestos over wood); provision made for food- and egg-store at end.

If there are two rows of three-tier batteries (double-sided) and with alleys, a house 30 ft. × 18 ft. × 10 ft. to ridge will hold 168 birds; 50 ft. × 18 ft. × 11 ft. to ridge, 384 birds; 74 ft. × 18 ft. × 11 ft., 600 birds; 124 ft. × 18 ft. × 11 ft., 1,056 birds. For planning guidance, allow 2¼ sq. ft. floor area per bird.

The design of the cages is no less important than that of the house. The best comprises all-metal cages; spot-welded 1-in. wire mesh (not wire-netting) for partitions and floors; floors of sufficient length to ensure that the hens cannot reach the eggs when laid; water provided automatically from mains or supply tank and water-troughs well away from mash-boxes; automatic but efficient cleaning of droppings-boards; waste-proof lipped mash-boxes, with partitions for grit and shell.

The dimensions of a cage should not be less than 17 in. deep, 14 in. wide, 18 in. high and 24 in. overall back to front.

For broodies. It may not be thought necessary to describe the special housing required to break off hens from sitting, but many thousands of eggs are lost by allowing broodies to remain sitting on the laying-nests. The provision of proper broody-breaking coops is as important as the erection of the laying-houses.

A broody coop is designed to accommodate layers in order to remove their desire to sit and to hasten return to lay. The best type has a slatted or woven wire floor and front, and solid wooden or asbestos backs, ends, roof and partitions. A platform or trough must be fitted along the front, for food and waste, reached by the birds through the front vertical bars. The outdoor type has 24-in. legs, and the indoor type is suspended on the inside wall or built into the ridge. All coops must have a sliding droppings-board 9 in. below the floor so that the excreta cannot foul the soil, so that it can be collected neat and used for fertilizing crops, and so that other birds cannot scratch in it.

A suitable size is 6 ft. $\times$ $1\frac{1}{2}$ ft. $\times$ 2 ft. high, divided into three compartments, each holding four broodies.

Features to note when purchasing are: stout legs; provision of droppings-board; practical food-and-water

trough; large door to each compartment. Where foxes are prevalent there must be a protective floor beneath the slats and a similar front made of ½-in. woven wire.

It is probable that one injection of a hormone derivative will stop a hen wishing to sit, thus making these coops unnecessary.

For fatteners. There are four types: (1) the slatted or wire-floored ark with or without legs, to which is attached an 18-in.-high wire-netting covered run; usually with raised wire-netting floor; (2) the fold unit; (3) the range of slatted-floored and fronted coops usually kept inside or else weather-protected; (4) the battery of all wire cages.

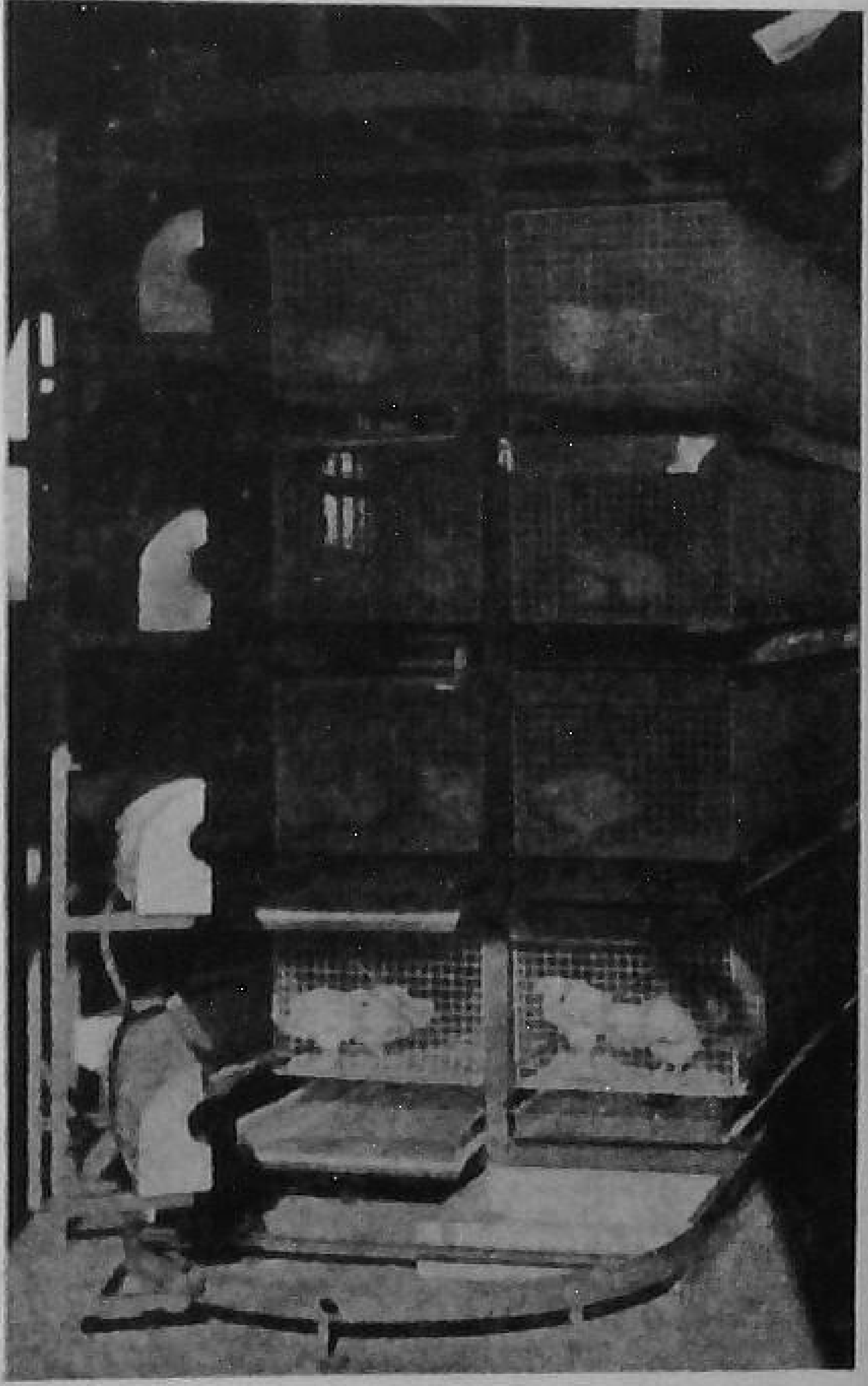
1. The ark and run is preferable for plumping-up poultry, because the desired result is more certain than intensive fattening. A convenient size is 6 ft. × 3 ft. × 2½ ft. high, and holds thirty young cockerels. The run is 6 ft. × 4 ft., running the length of the ark, allowing approximately 1 sq. ft. per bird, and is for the purpose of feeding and watering and to limit exercise, which, if allowed, will retard fattening and waste food.

An alternative but similar scheme to save housing is to use an ordinary grower's night-ark ringed with 4-ft.-high wire-netting on portable metal stakes; the run floor, if to be used semi-permanently, littered down with peat-moss or whole straw.

2. The fold unit (described on p. 71) is highly satisfactory for fattening, provided the nest-boxes are closed.

3. Fattening-coops are slatted-bottomed-and-fronted pens built up in single or double tiers in a well-ventilated shed, and fitted with troughs and drinkers in the front and droppings-boards beneath. A good size for each coop compartment is 2 ft. long by 1½ ft. deep by 20 in. high, which holds four fattening birds, the period of confinement being three weeks.

4. A fattening-battery consists of tiers of cages of metal or wood, built back to back, and is similar to a range of fattening-coops (Fig. 22). Droppings-boards must be provided. These cages are best used for the three weeks' fattening of birds off range. It is most difficult to get satisfactory results from table-chickens which are reared in a battery brooder and then transferred to fattening-cages without being given liberty.



[D. McMaster & Co. Ltd., Bures, Essex

FIG. 22.—A modern automatic fattening-battery which is labour-saving.

'Prime Surrey' fowls (the acme of table quality) are produced by housing the birds in coops or cages and cramming each one individually by the use of a machine.

For ducks. Most manufactured duck-houses are useless. The best design possesses these features: floor of $\frac{3}{4}$-in. spot-welded galvanized-wire mesh raised 10 in. above the ground; half the front of similar material and hinged at the bottom to open and drop down to form the run-up; top, ends and back solid; sloping weather-board at top of front 12 in. deep. The body of the house merely rests on the floor, and is *not* attached to it (Fig. 23).

The best size is 6 ft. long by 3 ft. deep by 3 ft. high at front and 2 ft. at back, and holds eighteen ducks. The design is simple, but important to follow. No perches are used.

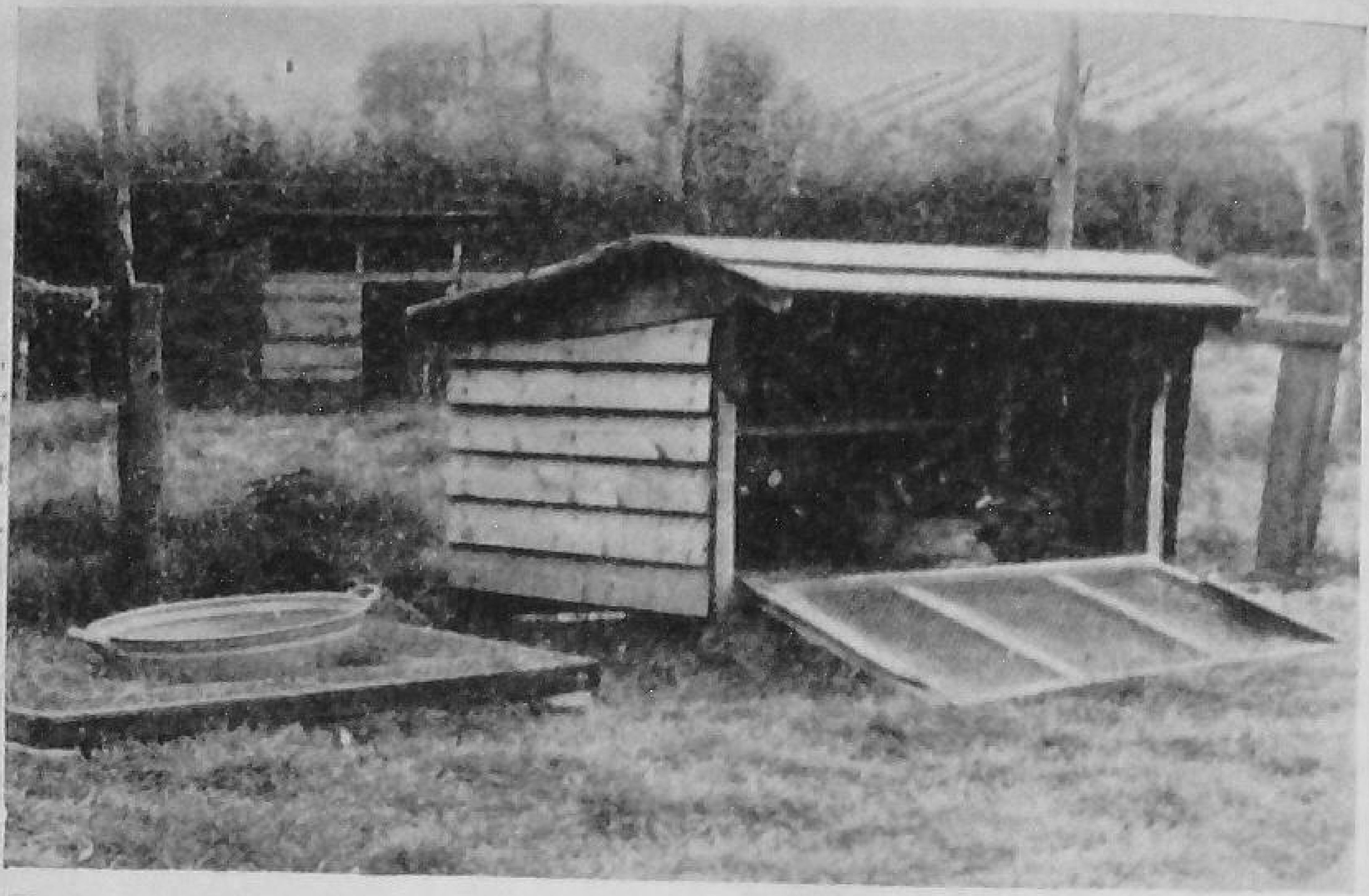


FIG. 23.—Laying ducks need only a simple type of house and preferably with ¾-in. mesh wire floor for some litter

For trap-nesting, each duck is driven in to a drop-down nest at night—and let out in the morning. These trap-nests are built in rows of a dozen, and must be weatherproof.

It is rarely profitable to allow ducks to sleep out. The house described provides a dry bed at night, full protection from bad weather and, what is more, protects the eggs from rats and crows.

For geese. These poultry may well sleep out unless foxes are troublesome, when a house of duck type is excellent, but of size 10 ft. long by 5 ft. wide by 5 ft. high. An alternative is to house them in an out-of-use laying-house or in a farm building, littering down with straw. Geese do not perch.

For turkeys. The same houses as recommended for chicks, growing and laying-fowls are suitable for turkeys, provided the size is convenient for this larger type of poultry. For large numbers of turkeys after the age of three months there are two designs of proved value.

For portable use, nothing is better than the roofed wire-

netting perching veranda. The span roof is of light wood or corrugated iron, and the sides and ends are of 2-in.-mesh wire-netting (with a 4-ft. door in one side). If the position is exposed, then one side and one end can be covered with corrugated iron. Two handles are fixed at each end for movement. Perches of 2-in.-wide battens are fixed 2 ft. above the ground and 20 in. apart, and an 8-in. perch-length is allowed for each four-month-old turkey. A good size is 9 ft. × 6 ft.

For a permanent building, nothing can equal a lean-to shed made solid at the back, two ends and roof, and all wire-netting at the front. The whole of the shed is fitted with perches 2½–3 ft. above the ground, and the floor is thickly littered with straw.

The use of ordinary slatted-floored laying-houses can be advised, too, and these are excellent for stubble ranging.

Other buildings for food-store and incubator-room are described in Chapters IX and X.

Loose-littering. The floors of all solid-floored houses (other than those for the deep-litter system) must be kept covered with light, loose, dry, clean and dust-free material, the purpose of which is to encourage exercise by scratching, to provide a comfortable surface for the birds' feet, to clean the feet and obviate egg-shell soiling, to act as a cushion for the feet when the birds jump down from perches, hoppers and nest-boxes, to check floor-draughts and to absorb excreta and aid sanitation.

It is important to renew litter as soon as it becomes heavy, close, damp or foul. The giving of the first feed of the day in the form of mixed corn (2 oz. per bird), buried in suitable litter, provides exercise which stimulates the egg-yield, assists digestion and wards off disease.

The used litter makes a fine fertilizer, but must be put on to the land straight from the houses or stored under cover, in

FLOOR MATERIALS FOR LOOSE-LITTER SYSTEM

Variety	Advantage	Disadvantage	Depth to use (in inches)	
			Chicks	Adults
Peat moss.	Most absorbent.	Dark in colour.	½	2
Cut straw chaff or flights.	Appreciated by all poultry. Light in colour.	Moderate absorption.	½	2
Whole straw.	Liked by fowls. Oat-straw best.	Unsuitable for chicks.	—	6
Dried bracken tops.	Free for gathering. Cut upper 12 in. of plant and dry.	Wears rather quickly.	—	6
Dead leaves.	Most useful. Must not be mouldy. Longest lasting are beech, oak, willow and ash.	Dark in colour.	—	4
Shavings.	Most acceptable. Light, and have restrictive effect on body insects.	Not very absorbent.	½ if fine	6
Sawdust.	Useful as a bottom litter for longer material.	Mats down rapidly if used alone.	—	2
Chopped flax shives.	Clean and light in colour.	Not very absorbent.	½ if fine	2

Materials not to be recommended are hay (mats too quickly), coffee husk (not absorbent) and cocoa shells (poisonous if eaten).

Dual-littering is an excellent idea, in that it increases the life of both types of materials. The longer one serves to prevent clogging and assists evaporation, and the shorter one absorbs the liquid part of the excreta, checks floor-draughts and cleans the feet.

FLOOR MATERIALS FOR DEEP-LITTER SYSTEM

Variety	*Advantage*	*Disadvantage*	*Maximum amount to use in mixture, per cent.*
Peat moss.	Very absorbent. Long life.	Costly. Dark. Dusty. Non-light-reflective.	75
Cut straw (1–1½ in.).	Light. Ample supplies.	Low absorption.	25
Flights: chaff cavings.	Pale in colour. Cheap.	Too light—blows about. Low absorption.	25 with peat-moss
Whole straw.	Needs no preparations. Pale colour.	Mats badly. Not easily moved. Low absorption.	10 with peat-moss but not as starter
Shavings.	Light. Cheap. Medium. Absorbent. Keeps litter open texture.	Not so absorbent as sawdust.	50
Sawdust.	Light. Cheap. Very absorbent. Free from dust.	Should not be too fine.	75
Dead leaves.	Free for gathering.	Dark—low absorption.	30
Dried bracken tops.	,, ,,	Dark—medium absorption. Wears quickly.	30
Chopped flax shives.	Light. Cheap. Equal to fine shavings.	Medium absorbent.	40
Chopped hay (1–1½ in.).	Pale. Cheap if off own farm and hedgerows.	High absorption. Often dusty.	30

Depth.—Start in warm, dry month with 6 in. When damp (six–twelve weeks) sprinkle with hydrated lime (1¼ lb. per 100 sq. ft.) and fork under. Turn over weekly, and add fresh litter only occasionally.

order to prevent loss of nitrogen. The newer deep-litter system is described on p. 55.

3. VENTILATION

Every house for every age of stock must be efficiently ventilated at all times, in order to: (1) supply oxygen (fresh air) for breathing; (2) remove carbon dioxide (stale air); (3) remove moisture which is carried in the air breathed out; (4) prevent draughts.

Many houses are badly ventilated, probably because of the wrong belief that poultry must be kept warm. This is not so. The feathers are sufficient to protect the fowls from temperature changes. Poultry require fresh air at all times and protection from bad weather—that is, rain and wind.

Ill-ventilated buildings result in outbreaks of catarrh and roup and in debility and loss of stamina. Laying-fowls require more air in proportion to their body-weight than larger domestic animals, and at rest breathe in 1 pint of air per minute.

In lean-to houses with a depth of 8 ft. or less and with one-third the front of open wire-netting or open windows, air movement is sufficient by diffusion.

In deeper-span-roof houses with most of the front windowed or shuttered, air movement must be arranged by providing low air-inlets for fresh air and high air-outlets for foul air. Watch these features when purchasing. Most houses allow for air-outlets, but few for inlets near the floor.

Air movement outwards can be increased by raising the ridge-board, by sawing out 12-ft. width along the whole of the front top and covering with $\frac{3}{4}$-in. wire-netting, or by boring holes 1 in. × 12 in. apart 6 in. from the top at the back. Air inlet can be provided by removing (partly or wholly) one or more of the glass windows at the back of the

house, by boring 1-in. holes 6 in. apart 12 in. above the floor along the house-back, or by sawing out 12-in. × 6-in. holes 12 in. from the floor in the house-back and baffling.

Baffling, to check draughts, can be done by covering the hole inside with a box of plywood to deflect the line of air movement downwards, or by covering with fine perforated zinc or hessian.

For the deep-litter system air movement must be constant and ample, in order to carry away quickly the water liberated from the litter, and to allow five to six air-changes per hour. Simple windows and ventilators are usually sufficient.

The laying battery-house, however, needs more precise ventilation by baffled floor inlets, high-ridge outlets and wide-opening windows for hot days. Proprietary types of ridge extractor cowls are efficient.

Air movement at night is vitally important, and many bad results are due to forcing birds to sleep in pockets of unmoved foul air.

4. PROTECTION

Poultry require protection from heavy rain or snow, fierce winds and from vermin. The house must be so designed or altered as to provide such protection.

Rain. Any type of house must be kept absolutely dry inside. Rain can be kept out by the use of sloping storm-boards of wood or glass to protect open wire-netting; of glass windows (to push out from the bottom or fall back from the top); of wooden shutters (to draw up—though these are not to be recommended); of calico or hessian to button or hinge (good for summer, but not for winter).

Glass is preferable to wood or hessian, and if only manufacturers would realize it, it should be $\frac{1}{4}$-in. thick and of an unbreakable variety, or embedded with wire-netting. For chick brooding houses, intensive and battery houses it

should be of a variety which allows the passage of the ultra-violet rays from the sun.

The windows must be of a type which require the minimum of adjustment. We cannot spare the labour to slide shutters up when it rains and down when the sun comes out. Watch these points.

The house itself must keep out rain. Here are the details: The roof must extend to at least 6 in. beyond the walls to shoot water clear. The walls must fit over the floor (and not on it), so that rain cannot seep in; the roof and outside nest-boxes must have a secure roof; the walls must be of a material that does not split or warp; the floor must not allow dampness to seep up; all open netting must be protected.

The roof must be covered with a material which lasts. The popular bituminous felt, the two-ply, 40 lb. for 12 yd., 36 in. wide, should be the minimum weight, but better the three-ply 50 lb. See that it is laid and fastened securely with black felt cement—NOT battens. Even horizontal shiplap boards need felting.

The best floor is of pressure-creosoted 1-in. tongued-and-grooved edged boards, built on specially strong joists and raised at least 10 in. above the ground on brick or cement piles. It is warm, always dry, easily cleaned, portable and rat-proof.

Wind. Fowls exposed to heavy winds go off lay and lose condition without the poultry-keeper realizing the cause. The house interior is protected from wind by the use of glass windows and storm-boards as suggested for rain, with the difference that closer shuttering is necessary during the gale periods.

Where the house is of the open-fronted, lean-to type, covered with wire-netting, the top storm board will not be sufficient to give wind protection, and it will be necessary

to nail over stretched cut-open sacking. Whatever the design, adjustment MUST be made to prevent wind sweeping the interior.

Vermin. Absolute and complete protection must be given. Every house must be proof against rats. It is easy enough to prevent establishment; costly and difficult to eradicate. The five steps to take which will ensure absolute freedom are: (1) keep cats of a rat-catching strain; (2) provide no harbourage by raising wooden floors 10 in. above the ground, or making floors of cement, glass or netting; (3) keep all food in rat-proof bins; (4) make houses secure by the use of $\frac{3}{4}$-in.-mesh wire-netting, *not* 1-in. mesh or larger (for stoats, use $\frac{1}{2}$-in. mesh); (5) burn all refuse.

5. LIGHT

This must be considered under the headings of: daylight; sunlight; artificial light; and shade—all of which are necessary at specific times.

Daylight. Every house must be properly provided with glass or other openings so that daylight lighting is adequate, the reasons being that: (i) indoor feeding and scratching (where litter is used on a solid floor) can begin early and continue late in the day; (ii) development of insanitary conditions (and consequent establishment of disease) is restricted; (iii) the poultry are kept cheerful and happy and less likely to develop vices such as feather-picking; (iv) work inside the house can be done properly and quickly.

For solid-floored houses at least 1 sq. ft. of glass is necessary for every 5 sq. ft. of floor-space, and one seventh of the glass area should be fitted low down on the rear wall. Thus a house 12 ft. × 8 ft. of 96 sq. ft. requires a minimum of 20 sq. ft. of glass, 3 sq. ft. of which are in the back. Deep-litter houses need limited glass area because an excess may chill the house in cold weather.

Battery houses should have roof light of $\frac{1}{5}$ sq. ft. and side lights (both sides) of $\frac{1}{4}$ sq. ft. per bird.

The windows must be in such positions not only to afford general and even lighting, but also to light the floor where it is littered and to encourage exercise by scratching.

To aid reflection of light and to produce a still more pleasant environment, the inside walls, ceiling and the under-surface of droppings-boards and fitments must be painted with a white, washable distemper containing a proved disinfectant, such as 'Deosan' or 'Izal'. The popular coating of limewash has no disinfectant value, provides cover for mites and wears off rapidly.

Sunlight. Direct sunlight shining on to the birds enables them to elaborate vitamin D within their bodies. This vitamin is vitally essential for good health; but the rays cannot pass through ordinary window-glass. Poultry kept intensively or in batteries (that is, always confined) must therefore be housed in buildings into which the sun's rays can penetrate; this is effected either by fitting special glass (such as 'Vitaglass') which passes the rays, or by using open wire-netting in the windows to be protected in bad weather by sliding glass shutters. Birds in batteries and deep-litter houses must rely more on the vitamin-D content of the food, for it is not possible to arrange for sunlight to shine directly upon all of them.

True, a sufficiency of vitamin D can be assured in a ration by incorporating 1 per cent cod-liver oil, but sunlight has other attributes, for example, as a germicide and for evaporating moisture quickly.

Artificial Light. This is essential to increase the egg yield to a profitable quantity during the period of short daylight, that is, from October to January—and thus of obtaining eggs when they sell at the highest winter prices. It does not increase the annual egg yield per bird, but moves the season of high egg production from spring to winter.

A good and economical practice is to light up for two hours as follows: lights full on 12 midnight; lights dim 1.45 p.m.; lights out 2 p.m. The dimming is done to ensure that the bird returns to perch before putting the lights completely out, but is not necessary where birds are in battery cages. Pellets are preferable to any other form of food for night feeding.

Electric light is the only practical commercial type of illuminant, and to save labour the lights can be operated by an automatic time-switch or by hand from the dwelling-house.

Artificial lighting stimulates the pituitary gland, and thus the ovary, and also enables the birds to see to feed and drink.

All lighting for battery birds must be even and the intensity the same upon the bottom row as the top. Two sixty-watt bulbs at 10 ft. apart, and without reflectors or globes, and suspended 2 ft. and 6 ft. (for even lighting), give excellent results. The outside cages can be lighted with bulbs (with reflectors) fixed to the house walls, and thus shining inwards on to the cages.

For intensive loose and deep litter, a 100-watt bulb at 7 ft. above the litter is correct for 200 sq. ft. floor area.

Literature dealing with artificial lighting is: 'Use of Artificial Light', by G. M. Curtis; 'What Electricity is Doing', by M. M. Harvey; 'Housing of Poultry', Ministry of Agriculture Bulletin No. 56; and several leaflets issued by the National Institute of Poultry Husbandry, Newport, Salop.

Shade. Excesses of any one thing, however good it may be, are detrimental to well-being. So it is with sunlight, especially during periods of heat. Forced exposure to hot sun upsets health, retards digestion, checks laying and may lead to serious prostration.

It is clear to an observant poultry-man when a fowl needs sunlight and when it desires shade. It should be able to choose. The provision of shade is by no means unimportant, and it must be cool and deep. The most acceptable shade is outdoors (see p. 113); but the house needs shading, and particularly so if the birds cannot escape, as in the intensive or battery system.

Shade is best bestowed by removing the glass or opening the window and fitting over it a sloping (45°) frame of tightly stretched hessian or green tarpaulin; or of spraying existing windows with green greenhouse shading paint. Windows should be chosen through which sun enters between 12 noon and 3 p.m. Greenwich mean time, for at this period the sun's rays are hottest.

At the same time, ventilators and doors should be opened to allow a free flow of air through the house. The shade can scarcely be too dark, cool and airy during heat waves.

6. SPACE

For the ten years prior to 1939 one of the greatest faults was overcrowding. Too often it was the unrecognized cause of lost stamina and increased disease susceptibility. On many poultry-farms the policy (short-sighted though it was) was accepted that the greatest profits came from accommodating in a house as many birds as that building could hold. It was a bad mistake. Surely the maximum profit results only if all the birds are at all times in perfect health, although our wider knowledge of nutrition to-day would serve to overcome failures due to crowding or wrong house conditions combined with incomplete feeding.

Under (2) 'Specific Purposes', I have detailed satisfactory accommodation. Here is the complete set-up. For outdoor range, see p. 178.

MINIMUM FLOOR AREAS

Age	Type of house	Fowls	Ducks	Turkeys	Geese
		Number of birds per sq. ft.			
Day old.	Solid-floored brooder house.	3	3	3	3
	Wire-floored brooder.	6	6	4	4
	Battery cage.	9	—	—	—
Eight-weeks old.	Slatted or wire-floored ark.	4	4	3	3
	Solid-floored house and slatted platform.	3	3	3	3
	Solid-floored house and perches.	1	1	$1\frac{1}{2}$	$1\frac{1}{2}$
	Fold unit floor area.	3	3	3	3
		Number sq. ft. per bird			
Three-month growers.	Slatted or wire-floored ark.	$\frac{1}{2}$	$\frac{1}{2}$	$1\frac{1}{2}$	$1\frac{1}{2}$
	Solid-floored perched house with run	2	—	3	—
	Fold unit floor area or solid-floored house with slatted platform.	$\frac{1}{2}$	$\frac{1}{2}$	$1\frac{1}{2}$	$1\frac{1}{2}$
Adults.	Solid-floored intensive house (loose or deep litter).	3 to 4	—	6 for fattening	—
	Sun-parlour for above.	2	—	4	—
	Semi-intensive solid-floored house with run.	3 to 4	—	4	—
	Solid-floored with slatted platform.	—	1	3	3
	Slatted or wire-floored laying-house.	$\frac{3}{4}$	$\frac{3}{4}$	$2\frac{1}{2}$	$2\frac{1}{2}$
	Slatted floor (of fold unit).	$\frac{3}{4}$	$\frac{3}{4}$	$2\frac{1}{2}$	$2\frac{1}{2}$
	Attached run (of fold unit).	3	4	5	6
	Laying battery.	$2\frac{1}{4}$ of total floor area	—	—	—
	Laying battery.	$1\frac{1}{2}$ of cage area	—	—	—
	Hen-yard.	2 inside house and 4 in yard	—	—	—
	Fattening-coops or pens.	$\frac{3}{4}$	1	3	—

Duck-, turkey- and goose-nests are made on the floor. The size for each for ducks is 12 in. × 12 in., for turkeys and geese 18 in. × 18 in.

Perches. These must be rigid, though removable. The best support is of metal, with a cup built in to hold grease, to stop infestation at night by red mites; an alternative being a wooden or metal slot, which is frequently swabbed with paraffin to kill mites. Perches should usually be on the same level (except in some deep-litter houses to save floor space) and smooth of surface. Strength is provided by the depth of the wood not by the width, the correct sizes being given in the chart on p. 90.

For deep-litter houses one can have either (*a*) movable perch platforms, (*b*) fixed perches and droppings-pits or (*c*) combined perches and mash-trough. Platforms are made 18–24 in. high, the perches being 15 in. apart, in sizes to suit the house. They are moved daily to ensure even distribution of droppings across the litter.

Fixed perches follow the lines of a loose-litter intensive house, except that no droppings-boards are used, the excreta falling through to a pit or area beneath, and the birds being kept away by 1½-in.-mesh wire-netting fixed on the underside of the perches and vertically in front. Cleaning out is done twice a year. Excluding the pits, the available floor area per bird should be 3–4 sq. ft.

A combined perch and mash-trough is sometimes used, the day feeding-perches at each side acting as night sleeping-perches, a double-sided 10-ft. trough taking twenty-eight layers and being moved daily.

Droppings-boards. Every perch other than in deep-litter houses should have a droppings-board beneath for the purpose of preventing fouling of the scratching litter (in solid-floored houses) or of the soil (in slatted- or wire-floored houses); discouraging birds from scratching in the excreta;

preserving the droppings for use as fertilizer; making cleaning out easy.

The board should be of asbestos sheeting or of wood covered with galvanized-sheet metal; *not* of matching or boards. The distance between perches and boards should be at least 6 in. (better 9 in.), and the boards should be easy to slide out, and should have a 3-in. lip both back and front, to prevent excreta being knocked off and to serve as an alighting perch for the fowls.

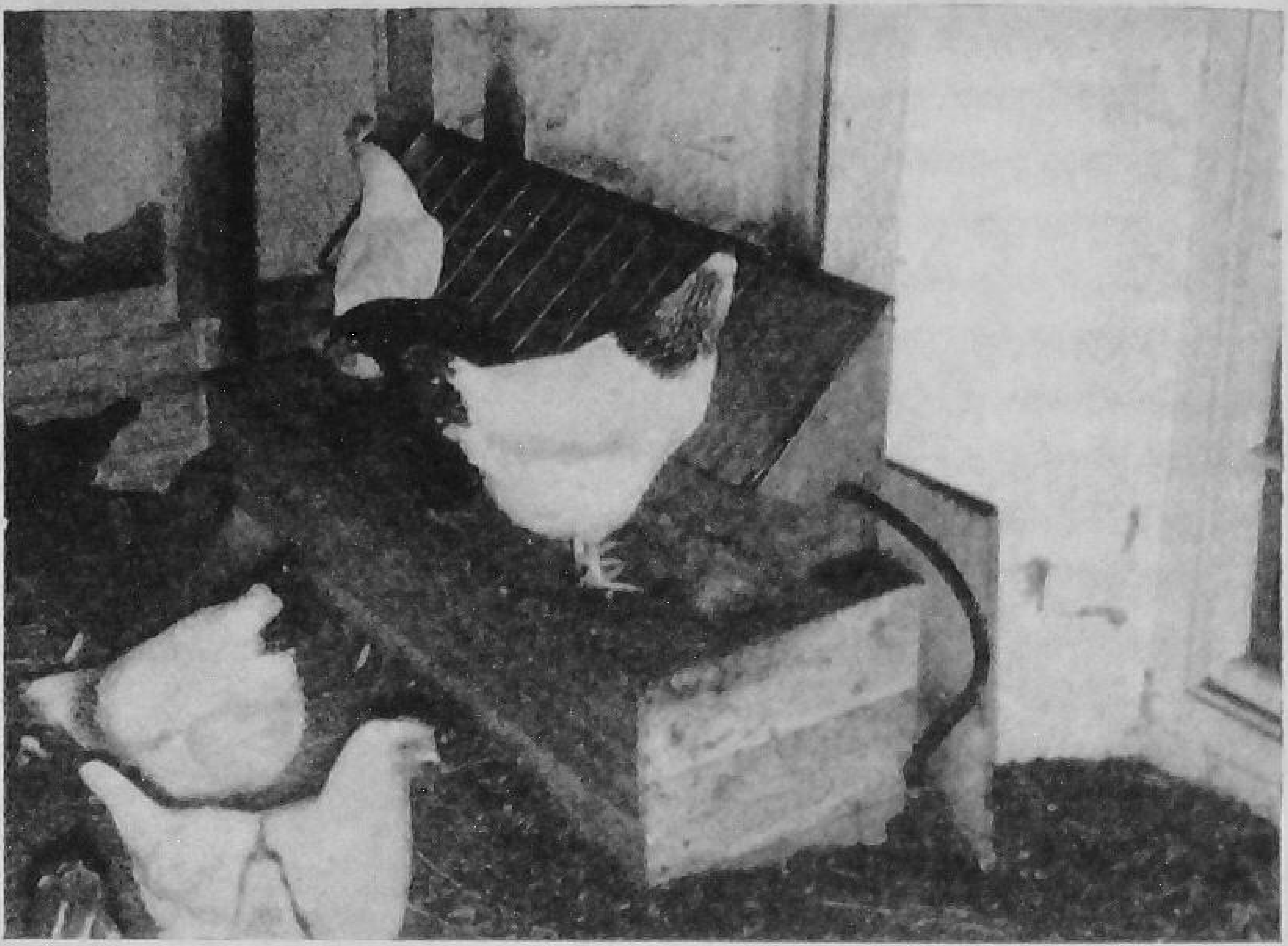
To protect one perch, the board should be 18 in. wide; two perches 36 in.; and so on. A space of 3 in. must be left between the board and the back of the house, to allow of air movement around the birds on perch. The board should be painted with white washable distemper on the underside to reflect the light.

Slatted or wire floors of arks, laying-houses, broody and fattening coops should also have sliding droppings-boards fitted, although if such houses are moved so frequently that distribution of excreta on the soil is even and sparse, then the boards can be dispensed with.

Droppings-boards are rarely used in deep-litter houses.

Water-vessels. It is wrong to stand any water-vessels on the floor inside the house. They must be hung on the wall or placed on a table platform 24 in. above the floor (Fig. 25).

If hung on the wall, a light wooden alighting platform must be erected of 3-in. wood, 6 in. from the fount. I consider the best scheme is to place galvanized or white-enamel three-gallon bowls or shallow pails on slatted platforms made on 24-in. legs, and to fill automatically by means of a valve and pipe from the main supply. Another good idea is to make a table on 24-in. legs, with a top 24 in. × 24 in., and cut a hole in the centre to fit a three-gallon bucket to allow of only 4 in. of the top protruding. If this is placed near a window it will not be necessary to enter the house for filling.



[*Swifts of Scarborough, Ltd.*

FIG. 25.—A modern waste-proof water trough supplied by the mains

Devices must be at hand for slightly warming the drinking-water in severely cold weather. One can use electric immersion heaters or paraffin economy lamps on a metal base, upon which the water-vessel stands. This warm water is one of the secrets of a high winter egg yield.

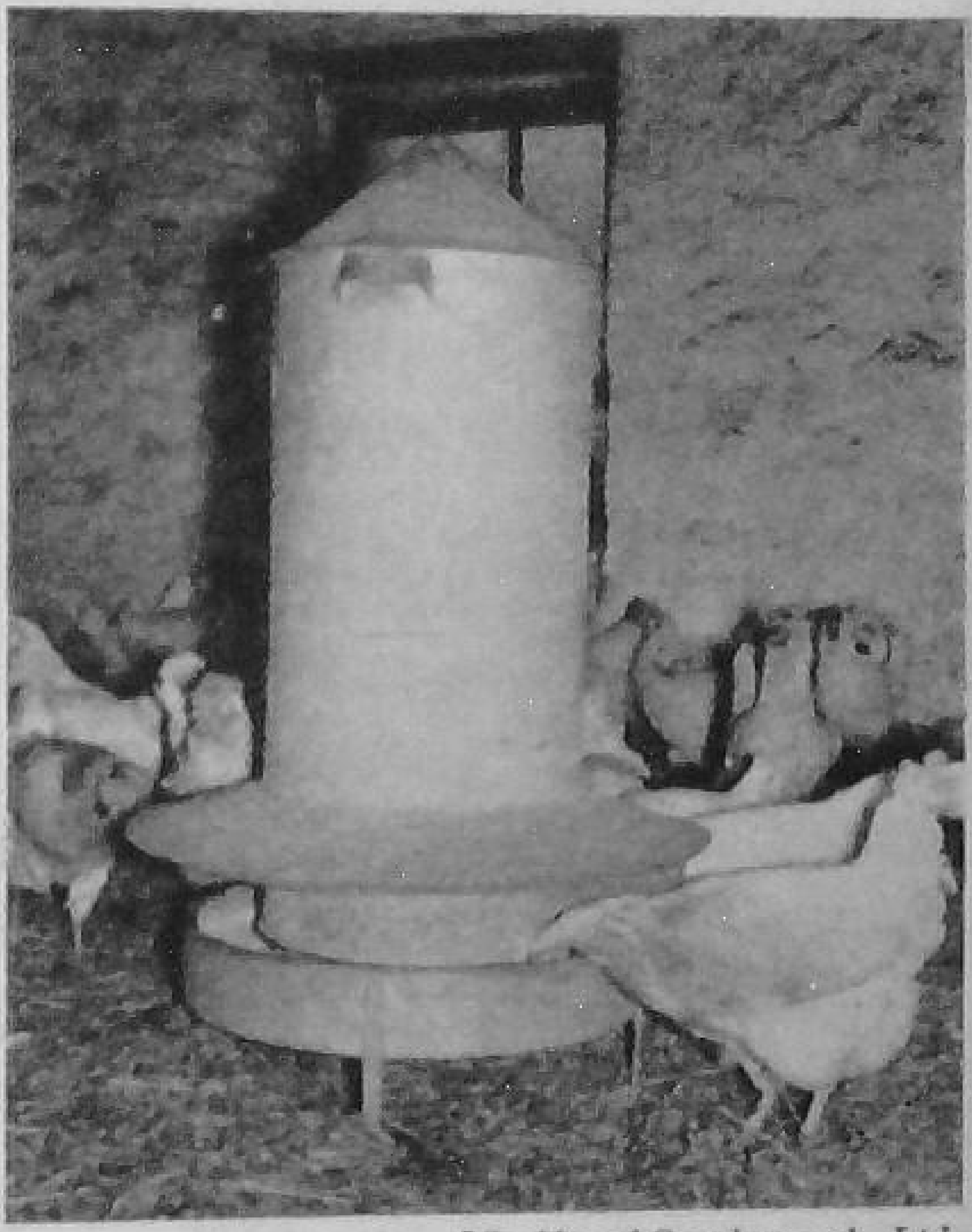
For adults three gallons capacity is suitable for twelve hens, but for deep-litter layers one automatic fount is sufficient for 150 birds.

Water-vessels for day-old poultry must be small, holding two quarts, with a 1-in. trough, and must be increased in volume and number as the youngsters grow. For chicks of fowls and of turkeys the automatic fount with small trough is best, but for ducklings and goslings the sooner one can dispense with the baby fount and replace with an open trough, the better, in order to prevent waste of water and to ensure effective bathing of the eyes.

The best water-vessels for adult ducks and geese which have no natural water supply, such as a pond or stream, is a ten-gallon galvanized bath (enough for twenty ducks or ten geese) sunk in the ground to within 6 in. of the top, surrounded with a platform of $\frac{3}{4}$-in.-mesh wire-netting or cement, 2 ft. wide, to prevent bibbling of the soil into the water.

Water provided in the run *must* be shaded in the summer.

Dry mash or pellet feeders. These, of metal or wood, must not be placed on the floor, but raised on 24-in. legs, hung on the wall or placed on platforms in the laying-house (Fig. 26). The best type is an open trough, 14 in. wide and 6 ft. long, fitted with removable bars at the top to keep birds out, and with $1\frac{1}{2}$-in.-wide overhanging lips inside to prevent birds raking out the mash with their beaks. A 3-in.-wide feeding-platform runs along each side. A box to hold four stone mash suffices for each thirty birds, and will need filling once a week.



[*Swifts of Scarborough, Ltd.*

FIG. 26.—One of the best patterns of feeders for birds of all types and ages, indoors or outdoors

For young chicks in the brooder-house, dry mash-troughs are used on the floor. For thirty-day-old chicks a suitable size is 20 in. long by $2\frac{1}{2}$ in. wide by $1\frac{1}{4}$ in. deep.

Grit-and-shell boxes. A box or hopper each of flint grit (for grinding the food) and limestone or cockle-shell (for

CHAPTER VI

RANGE AND RUNS

POULTRY, other than those kept in batteries or on an intensive system, spend a far greater part of their lives outside than inside, and I feel certain that much of the pre-war low stamina and high mortality could have been avoided if the range provided had been of better quality, kept free from soil-borne disease and more liberal in area. There is no practical means of disinfecting soil to an effective depth.

It is false economy to crowd a large head of poultry on to a minimum area of soil; indeed, it is highly dangerous. Where area is limited, then an intensive method might well be adopted for layers.

Value of range. It provides a change of scene, and thus tends to prevent outbreak of vices such as feather-pecking; it allows and encourages exercise, and thus maintains the necessary hard and lean body condition; it ensures access to direct sun-rays, and thus enables the birds to elaborate vitamin D within their bodies; it permits the provision of shade which is always deeper and cooler than that inside the house; it provides valuable food in the shape of green food, insects and farm crops which would otherwise be wasted (that is, on stubbles); it enables the birds to eat soil, and thus obtain minerals of a mechanical or replacement nature which, as yet, are not included in any chemical mineral mixture.

Range is dangerous if it is heavily charged with droppings; if it contains the spores, germs or parasites to cause poultry

illness; if it is water-logged; if it provides neither shade nor shelter.

TYPES OF RUNS

The surface of runs may be of grass, cultivated crops, earth, cement, cinders, sand, straw, or wire-netting. Although I would advise grass if at all possible, there are circumstances in which the other materials can prove useful.

Grass runs. Good-quality grass is of undoubted value for all poultry. The growing herbage tends to check foulness, keeps the feet clean and provides a food of great merit.

Quality grass is soft, wide in leaf, deep green in colour, crisp, tender and juicy. Poor grass of little food value is hard, narrow, tough, dry, seeded, yellow or brown. Maintenance of quality all the year through must be accepted as an important item of management.

Much depends on varieties, the best being those which are dwarf, compact, close-growing, evergreen and leafy; the inferior ones tall, loose, tufty, coarse and worthless in winter. Pale green grass is often starved of soil food; blue-green grass is produced on soil containing an excess of nitrogen from excreta. Grass containing worthless weeds is also of low food value and must be renovated.

It must be realized that the more quickly a first-quality grass is provided (either by re-seeding or renovating) the sooner will the health of the poultry be kept at the needful high level.

Quality grass is ensured by growing the right varieties on land which is well drained, manured and cared-for. Heavy loams and clays are most suited for the production of grass of high food value, particularly during periods of drought, when green food is of most importance to poultry, but most soils can be improved, whilst quality herbage can be assured

by seeding with the most suitable varieties (see charts later in this chapter).

This subject of grass production is so important and wide that I suggest the following books be studied: 'Pastures and Pasture Plants', by W. G. Toogood; 'Science in Agriculture', by J. W. Paterson; 'Back to Better Grass', by I. G. Lewis.

Here, then, are the essential points particularly connected with poultry on grass.

Grass needs draining if the herbage is scant, thin or coarse; if water lays upon the soil; if the soil easily 'puddles' after rain; if rushes, meadowsweet, cowslips, silverweed, coltsfoot or horsetail flourish upon it.

Drainage is of two kinds—open and closed. *Open drains* are made on the surface, and are useful as a temporary expedient to remove flood-water, but I do not recommend them for permanent use, because they reduce grass area and interfere with traffic. *Closed drains* are covered so that the grass surface above is maintained; the water-way being constructed by the use of bundles of faggots, broken stones, old tins or clay pipes.

Proper clay pipes (called draining 'tiles') which last indefinitely are the best. Faggots rot away in four years; bricks fill up with soil; mole drains (merely holes made horizontally beneath the soil with a blunt bar of iron hauled by a tractor or engine) may last for ten years in a heavy clay, but become faulty in three years or less in a lighter soil.

Tests can be made as to the need for drainage by digging out test-holes 4 ft. deep and 2 ft. wide. Water will fill them to the height of the 'water-table', and if this stands to within 1 ft. of the surface for several days after a heavy rain, drainage would certainly be advisable.

The planning of the drains is important, in order to ensure the correct fall and lead-away, and it would be wise to consult

a neighbouring farmer. In light soils, the drains should be 3 ft. deep and 40 ft. apart; in heavy soils $1\frac{1}{2}$ ft. deep and 18 ft. apart.

The manuring of grass runs must be viewed in a practical light because the better the grass quality, the more food value will it offer to the birds. An established grass run rarely requires a nitrogenous fertilizer because the poultry droppings provide all that is necessary, but it is of benefit (particularly to encourage the growth of the finer grasses) to give a dressing of basic slag (containing phosphoric acid) in the autumn at the rate of 8 cwt. to the acre.

The other necessary soil constituent is lime which renders plant-foods soluble, improves physical condition, prevents souring and inhibits the development of germs of poultry disease. The most useful form of lime is finely ground limestone applied each spring at the rate of 1 ton per acre.

Where poultry are kept on the free-range system (p. 49) or moved frequently over fields carrying crops (for example, lucerne), then manuring must be planned to feed the crop for the purpose in view.

Dressings for specific purposes are ground quicklime at the rate of 2 tons per acre for soil upon which birds have suffered from coccidiosis, fowl-pox, B.W.D. or any soil-carried disease; agricultural salt, 1 ton per acre, to destroy the eggs of parasitic worms; blue-stone (copper sulphate) and dry sand (1 to 6) evenly broadcast after (but not before) a rain, at the rate of 14 stone per acre, to kill snails and slugs, which act as the intermediary host for tapeworms.

N.B.—While these specific dressings are valuable, I do not consider that one can rely upon them to afford the required complete destruction of the disease or host, and they must be supplemented by vacations of the runs for six months or, in severe infection, for twelve months.

Seeding of runs with special grass mixtures ensures first-

quality permanent nutritious herbage, and where the existing grass is of poor texture, then the re-seeding of runs (as they can be vacated) either in spring or autumn may be considered a worth-while operation. The most satisfactory plan is to enlist the aid of a neighbour farmer who will manure (farm-yard manure best), plough, harrow and sow.

As a guide to soil quality, certain weeds will be found associated with certain soil types. If the existing grass runs are in need of re-seeding and the soil is in poor heart, some of these plants will be found—rest harrow, ox-eye daisy, water-grass, Yorkshire fog grass and sterile brome grass; if in need of lime—cornflower, sheep's sorrel, corn marigold, bracken and spurrey; if in high fertility—good specimens of nettles, chickweed and fat-hen.

SEED MIXTURES

	Open land		*Orchards*	
	Light soils	*Heavy soils*	*Light soils*	*Heavy soils*
Perennial rye-grass	2	4	—	—
Perennial rye-grass, Danish late-flowering	4	2	3	4
Timothy	6	6	7	8
Rough-stalked meadow grass	—	2	—	2
Smooth-stalked meadow grass (Scandinavian)	3	1	4	2
Red fescue, S59	—	—	2	2
Milfoil	2	2	2	2
White clover, S100	2	2	2	2
Wild white clover, S184	1	1	1	1
	20	20	21	23
	lb. per acre			

I am indebted to the Grassland Department of the N.A.A.S., Eastern Province, for these mixtures and advice

which embody the more recent trends in poultry and orchard-sward requirements.

Modifications would be envisaged with extreme soil types and with extremes of management. But essentially the balance of these species should be approximately maintained for all conditions.

It is important to recognize that a balance of sward species should be started right. The fact that seeds are small in size and wrong conditions of soil may be met can alter the 'take' of a sward very considerably. Every endeavour should be made to get the best conditions in the soil, and matters of drainage, lime requirement and the needs for phosphates and potash made good before the seed is sown. One should stress also that some soils may be very low in humus content and it may be necessary to plough in a green crop like mustard, or rape and Italian rye-grass, as a preliminary to the establishment of a sward.

Apart from the above needs, it is a straightforward question of getting the right tilth and the right consolidation.

If the above conditions have been made good, and a good seed-bed can be produced by about mid March, then broadcasting the seed on a rib rolling, followed by a light harrowing and again rolling, would be preferred. If, however, the seed-sowing is delayed to April or early May, then it is best to drill, and a grass-seed ($3\frac{1}{2}$-in.) drill is more preferable to the 7-in. corn drill which is occasionally used.

Management can very materially influence a sward. With such a range of usage, from intensive to semi-intensive grazing, sward changes are bound to appear. Again, a sward will vary according to its proximity to the poultry-house—which suggests, if at all possible, a frequent change of position of the poultry-house.

In the first year of establishment the sward should be topped at about 4–5 in., as occasion requires, and only when

it is firmly established should poultry be allowed on it. This should, however, be possible towards June in a normal season.

Poultry prefer the clovers and young leafy grass, hence the management of the sward should be directed to maintain a good clover content and the grass in a young leafy stage. This means that one should carefully—or as carefully as is practicable—avoid either over-grazing or under-grazing. In practice this is best achieved by not allowing poultry too long a grazing period on a given pasture, and some sort of a rotation of grazing should be introduced. The under-grazing can be avoided by frequent topping—that is, cutting with a mower at about 4 in. high.

The main points to bear in mind in management are to keep a firm grip on the growth of a pasture, keeping it young and leafy by cutting it as often as is required, and again not to out-graze the clovers. Clovers are very much appreciated by poultry, and there is a danger that they will be pecked at unless, by frequent cutting of the sward, the grass is kept young, fresh and attractive.

Much can be done to manage grass runs so as to improve and maintain quality. The operations are harrowing or raking to aerate and remove moss, digging out large tufts of coarse grass, draining (p. 100), manuring (p. 101), re-sowing poor areas, mowing and grazing.

Mowing is the most important seasonal task of permanent grass runs. What I am going to say now is of the greatest consequence, but is too infrequently carried out—that is, to cut the grass when it reaches a height of 4 in. This will mean several mowings during the year. The purpose of this is to remove worthless fibrous stalks going to seed, to force the growth of new shoots (the really nutritious part of the grass plant) and to encourage the fowls to range far afield during wet weather without becoming soaked and bedraggled. It

SEED MIXTURES RECOMMENDED BY THE LEADING SEED-GROWING FIRMS

	Miln & Co., Chester		*Carter, Raynes Park*		*Sutton, Reading*		*Gartons, Warrington*		*Webb & Son, Stourbridge*	
	L.	*H.*	*L.*	*H.*	*L.*	*H.*	*L (field)*	*H (pens)*	*L.*	*H.*
New Zealand Cert. mother seed perennial rye-grass	10	10	—	—	—	—	—	—	—	—
Perennial rye-grass, S23	10	10	—	16	10	10	—	—	—	—
Kentish indigenous perennial rye-grass	—	—	24	—	—	—	12	—	15	15
Commercial perennial rye-grass	—	—	—	—	10	10	—	—	—	—
New Zealand crested dogstail	8	—	1	—	—	—	—	—	—	—
Creeping red fescue, S50	3	7	3	—	8	4	4	6	—	—
Rough-stalked meadow grass	—	2	3	8	3	3	4	6	3	6
Smooth-stalked meadow grass	—	—	—	—	—	—	4	6	—	—
Timothy, S50	—	2	4	8	—	4	3	4	—	—
Creeping bent, N.Z.	—	—	—	—	—	—	—	2	3	3
Cocksfoot	—	—	—	—	—	—	—	—	3	—
Chewings fescue	—	—	—	—	—	—	—	—	3	3
Yarrow	—	—	—	—	—	—	—	—	$\frac{1}{2}$	$\frac{1}{2}$
Wild white clover	1	1	—	1	1	1	1	1	—	—
Large-growing white clover, S100	—	—	$\frac{1}{2}$	$1\frac{1}{2}$	—	—	—	—	$\frac{1}{4}$	$\frac{1}{4}$
	32	32	$35\frac{1}{2}$	$34\frac{1}{2}$	32	32	28	25	$27\frac{3}{4}$	$27\frac{3}{4}$

lb. per acre

L = light soil. *H* = heavy soil.

is a good plan to leave a yard strip uncut, running east and west, to provide shade.

It follows, then, that an essential machine is a motor grass-cutter, and it will return high dividends. The cut grass can be raked up and used for nest-box litter, but the later cuttings from July can be left to remain as a mulch.

Grazing has an impressive effect upon quality, and, if properly controlled, yields that most nutritious sward of dwarf, compact and leafy grass resembling a lawn. It is incorrect to allow such a number of fowls to a run that the grass is kept eaten low, for some part near the house will be worn. The right plan is to give liberal area and graze the grass off. Suitable stock are sheep, cows and goats, the last two being tethered in a small run, or they will push the netting down.

Area allocations may be based on these figures. For free range, from 100 to 250 per acre, according to the type of poultry; for limited runs, 200 sq. ft. per fowl or guinea-fowl, 250 sq. ft. per turkey, 280 sq. ft. per duck, 300 sq. ft. per goose; for duplicate grass runs (see below) the two runs should give one and a half or twice as much area as above.

Duplicate grass runs. Although not common, this scheme allows of the use of two limited runs to each house, the purpose being to ensure freedom from disease which originates in or is propagated within the soil. It might well be adopted by breeders of pedigree poultry who purpose to plan and operate a poultry farm on the most modern and health-promoting lines.

Its only drawback is the necessity for a greater length of fencing than is needed for single runs. Its advantage lies in absolute protection from foul, stale, excreta-ridden, disease-bearing soil.

The minimum areas for the *two runs* are: fowls 350 sq. ft.; turkeys and ducks 350 sq. ft.; geese 400 sq. ft. per bird.

Convenient periods for use are from March to September (seven months) for one run, and from October to February (five months) for the other, although I prefer to keep close observation on grass quality and make a change over more frequently. The grass in the empty run should be raked and limed immediately on vacation, and cut frequently or grazed to keep it short and leafy.

Cultivated runs. Although not a popular scheme, this has much to commend it, in that the ground is kept sweet and disease-free, and healthful crops are provided. Two runs attached to the house are used. The plan is to grow grass in one run for permanent use and green-food crops in the other, into which the birds are allowed at controlled periods to feed.

Suitable areas for ordinary fowls are: grass run 150 sq. ft. per bird, and cultivated run 250 sq. ft. per bird; for other poultry 50 per cent more.

Success depends on the type of crop chosen, which must be quick growing and early maturing, so that at least two crops can be produced in the twelve months.

Cabbages offer the best crop for planting (not sowing), succession as follows:

Variety	*Distance in rows, in inches*	*Distance between plants, in inches*	*Plant out in*	*Use from*
Early Rainham or Offenham cabbage	14	14	March–April	April–May
Enfield market cabbage	14	14	June–July	Aug.–Sept.
Early drumhead cabbage	20	20	March–April	June–July
			June–July	Oct.–Nov.
Thousand-head kale	20	20	June–July	Sept.–May, as desired

Another quick crop is mustard, sown broadcast from April to August at the rate of 5 lb. per rood, and ready in six to

eight weeks from sowing. Rape should not be used, as it causes discoloration (green) of the egg-yolks if consumed in quantity.

Control is obtained by allowing the birds out for a short while—for example, one hour at noon. The plants continue to grow, and provide a regular source of food.

Earth runs. These are of plain earth, and because of the small area allowed per bird—that is, 20 sq. ft.—no grass or crops have the opportunity to become established. While satisfactory enough if managed properly in a garden, they should *not* be entertained on a poultry farm, because of the danger of becoming foul, stale and disease-ridden, unless used as hen-yards covered with litter.

Cement runs. A cement surface is useful only around a permanent brooder or laying-house, and then only to a width of 6 ft. and with the object of maintaining a clean germ-free surface as an approach to the quality grass beyond. I would much prefer (*a*) to have the house movable to a fresh site or (*b*) to protect the worn grass area (in proximity to the house) with netting or brushwood and renew any worn parts by sowing grass seed.

Cement runs are sometimes used with success for intensive laying-duck runs.

Cinder runs. These are useful to lay down around a permanent house to a width of 10 ft., to absorb the excreta, and they are also useful in providing a surface in which earthworms, which act as a medium for transferring gape-worms to chicks, cannot live. They take the place of grass-worn soil, which quickly becomes contaminated unless specially managed. The cinders should be mixed with a quarter of their weight of fine-ground limestone, and laid over the earth surface to a depth of 6 in. near the house, sloping off to 2 in., and rammed down hard and smooth. They may be swept clean and sprayed with disinfectant, but

need re-covering to 2 in. depth in twelve months, and renewing in twenty-four months. A run entirely composed of cinders should not be entertained.

Sand runs. These cannot be recommended.

Straw-yards. These are runs (usually part of a farmstead) attached to the 'Hen-yard' type of intensive house, which allows 2 sq. ft. per bird, while the straw area in the yard is 4 sq. ft. per bird. The yard is evenly sprinkled with straw to a depth of 9 in., and to this is added fresh straw once or twice a week to keep the top layer clean.

Thus the straw builds up to 2–3 ft. in twelve months, and is then cleaned out. Most of it is decomposed to make a valuable organic fertilizer. (See the Hen-yard System, on p. 58.)

Wire-netting-floored runs. These are of undoubted use for three purposes : (*a*) for providing sun-parlours along the front of intensive houses of laying-fowls (see p. 72); (*b*) for providing outdoor exercising cages in front of fixed brooder-houses for stock chicks to the age of one month and for fattening chicks until transference to the growing-on arks; (*c*) for fitting to slatted-floored arks (raised on legs) for the purpose of fattening fowls from eight weeks upwards.

These runs have wire-netting floors of ½-in mesh for chicks and ¾-in. mesh for older birds, raised above the soil, and are also covered with wire-netting at the top, sides and end.

FENCING

Fencing must be long and lasting, neat and efficient. Usually it falls into speedy disrepair, is untidy and unsatisfactory—purely because it is never considered to be of much importance.

Posts. The best woods are oak (but this is costly), chestnut (in areas where it is grown), and red deal (pinewood), and stakes should be 2 in. × 2 in. They must be

preserved; hard woods by coating with boiling tar and pitch mixture (8 to 1) and soft woods by creosoting under pressure (best) or by soaking in creosote or proprietary preservative.

Rustic poles of 3-in. diameter at the bottom make excellent posts, the best woods being larch or pine (because of the oil contained in them), or ash or hazel. The bark must be removed, or they will rot quickly. The best preservative method is to stand the freshly cut post in a bucket of copper naphthenate solution (cuprinol) for twenty-four hours, for this permeates the wood-grain and kills the fungus of decay.

Why not living posts—everlasting and shade-providing? The two suitable varieties are ash and willow, and they should be erected quickly after cutting (not preserving), between the months of October and December for preference, but not later than February.

An alternative scheme is to push 12 in. into the soil young straight branches (1 in. in diameter and 3–4 ft. long), close up to the ordinary erected posts, choosing ash, willow, elm or poplar—all of which root readily. If money is available then why not second-hand 2-in. galvanized water-pipes lasting a lifetime?

Posts should be 1½ ft. in the ground on heavy soil, and 2 ft. on light soil. The minimum heights are: for heavy-breed fowls and turkeys, 5 ft.; light-breed fowls, 6 ft.; ducks and geese, 3 ft. Guinea-fowls cannot be confined except by cutting the flight feathers of one wing only to within 1 in. of the flesh, when 5-ft. netting will suffice.

Erection. The best way to erect is to make a hole with a pointed, iron, 1-in.-diameter crowbar, drive the stake in with a 'beetle' (large mallet), and ram down with a rammer. Take care to point the stake accurately, or the post will not drive in upright. Line the posts up straight and level. Corner posts may well be of 3 in. × 3 in. timber, strengthened with sloping posts.

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The correct wire-netting is 2-in. mesh for adult fowls and 1-in. for chicks, 18-gauge, galvanized and British made.

Having set up the posts, drive in 2-in. wire nails to a depth of 1 in., and 12 in. apart. Do not use staples. Next unroll on the ground two or three yards of the roll of netting, in order to see which is the longer selvedge side, which goes at the bottom. Now follows erection. Hook over the top nail, hammer the nail over and knock flat. Then work down the post to the bottom. Aim at getting the top neat and level; the irregularity of the lower edge is useful for overcoming unevenness of the ground.

The netting can be pulled tight by using the hammer handle as lever between one of the meshes and the post. Erect tightly. Bulges can be taken out when nailing is completed by putting the fingers through the meshes, pulling towards the post and nailing down.

Two widths of wire-netting can be securely joined by passing a 2-in. nail through the adjacent mesh of the two widths and turning over three times to twist the wire selvedges together.

For full security and longer netting life, a $\frac{3}{32}$-in.-diameter wire can be stretched along the tops of the posts, to which the netting top is secured with wire. I have never found this necessary.

There are three schemes for ensuring close contact at the bottom. One is to peg to the ground by driving in 12-in. wooden or wire pegs 3 ft. apart. Another is to bury the lower 3 in. of wire in the soil, in which case removal is difficult. The third plan is successful on level ground down to grass, and that is merely to pull down the netting to ensure close contact with the soil and rely upon the grass to effect the necessary security.

Poultry escape easily through hedges, which can, however, be made fowl-proof by running along 3-ft.-high 2-in.-mesh

wire-netting and securing with wire round small hedge-stems and with nails in larger ones.

Wind or mating screens. The lower 2 ft. of the fence can be made up of boards or corrugated-iron sheeting, and this screen is valuable as a wind-break on exposed sites, or between breeding-pens of mated birds, to prevent the fighting of the males through the wire-netting. Between-runs for laying-birds I consider an unnecessary expense.

If one has to bring into temporary use runs for mated birds which prove pugnacious, the best screen is of green rot-proof tarpaulin 2 ft. wide, made with grass eyeletted $\frac{1}{2}$-in. holes to permit of fastening to the netting.

Gates. Most gates are bad, being narrow, tedious to open, weak in construction and allowing escape of the fowls. The efficient gate allows passage of the widest appliance likely to pass through it. A wheelbarrow needs 3 ft., but as the efficient poultry farm will make use of rubber-tyred trucks, the gates must be designed to accommodate them. Although the truck is usually $2\frac{1}{2}$ ft. wide, it is 6 ft. long, and allowances must be made for turning in without fouling the gate-posts. I suggest $3\frac{1}{2}$-ft. width for all gates.

Gates for moving machine or farm-carts (for example, in large runs on smallholdings) are best of the double type, hinged at the sides, opening from the centre, and 9 ft. in width.

Hinges should be screwed or bolted, and double-acting, so that the gate opens both ways, and so fitted and maintained that a light push effects the opening.

The post holding the gate must be really strong, of 3 in. × 3 in. timber, $2\frac{1}{2}$ ft. in the ground. The gate must be braced, to prevent sagging, and should finish at the top with wire-netting; *not* with a wooden cross-bar, or the poultry will fly over.

The best catch is of stout wire, forming its own hinge by

being passed through a hole in the post and released from *both* sides.

Have plenty of gates, to save unnecessary journeys, and use old bricks and discarded tarmac from roads and aerodromes for ramming down in and around the entrances, to stop puddling up in the wet weather.

SHADE AND SHELTER

Range is infinitely more valuable to poultry if it is provided with shade (against hot sun) and shelter (against heavy winds and sudden rains).

Shade is best of a natural variety, as provided by trees, hedges and copses. I consider it essential to plant trees and to cultivate existing hedges. One excellent plan is to use living boughs as netting-posts (p. 110). But why not plant standard fruit-trees, and thus obtain an extra profit (p. 242)? Whether fruit or forest trees are to be planted, make certain of obtaining an expert opinion from the County Advisory Agricultural Service as to the most suitable varieties.

When planning the runs, try to allocate an area to each in which some natural shade is provided. If this is not possible, then artificial shade, necessary during hot weather, can be assured by making wigwams or tunnels of brushwood, or by fixing up sheep-hurdles or wire-netting framework thatched with straw or covered with hessian (cut-open sacks).

Shelter is equally necessary to offer a comfortable corner during periods of high wind, which have a most disturbing effect on poultry. Again a thick hedge is ideal; but, failing this, hurdles of straw or brushwood can be used, or four corrugated-iron sheets fixed to posts to form a cross to ensure choice of shelter from whatever quarter the wind is blowing.

Protection from rain is not so important, so long as the

house is comfortable. Sudden and short rainstorms drive birds into their house (unless wind-shelter screens are available); but steady rains likely to continue are regarded by the poultry as inevitable, and little notice is taken of them.

Foxes. These vermin do tremendous damage among poultry, and are difficult to fence against. They can climb a 6-ft. wire-netting fence, although such an occurrence is not common. Two precautions of value are: (1) to bury the lower 12 in. of netting in the soil and (2) to fix three strands of close-barbed wire 6 in. apart and 6 in. above the netting.

Legal points. A poultry farmer must fence his poultry in. There is no obligation on his part to erect a fence to keep his neighbour's poultry out. The owner of birds is liable for damage done by his birds on other property.

Where the boundary consists of a hedge and a ditch these usually both belong to the property on the hedge side. Ditches must be kept clear, to prevent overflowing on to the neighbour's land.

Branches overhanging a boundary can be cut off at the boundary line. Weeds must be kept under control, and seeding prevented.

MEASUREMENTS

Before a range is fenced, proper plans must be made to ensure the minimum expenditure of labour required for feeding arrangement. It is well to refresh your 'arithmetic' by buying a simple text-book which includes mensuration. You will also need to be acquainted with the tables for long and square measure. To gain a mental picture one can obtain an Ordnance Survey map 1 in. or 6 in. to the mile, or one can measure up the ground and draw out on graph paper.

To permit the best use of the land, run areas must be based upon the number of poultry required to be accommo-

dated, allowing each bird the area suggested earlier in this chapter.

To obtain the area of a square or rectangle, multiply the length by the width; of a circle, multiply the diameter by $3\frac{1}{7}$; of a triangle multiply the base by half the height.

Thus, if you wished to fence a limited grass run (p. 99) to hold 100 laying fowls (allowing 200 sq. ft. per bird), one side of which has of necessity to be 200 ft., you would work it out like this. The total area required would be 100 × 200 sq. ft. As the size of one side is already known (200 ft.), the other side of the rectangle would be $\frac{100 \times 200}{200}$ ft., which is 100 ft.

The most economical shape for netting length is a square, and this is more evenly grazed than the expensively fenced, long, narrow run covering the same area. To fence a square of an acre (of 4,840 sq. yd. having a side-length of approximately 70 yd.), six rolls of wire-netting, each of 50-yd. length, will be required.

To find the area of an irregular field, it is best divided into triangles.

Long measure

12 in.	= 1 ft.
3 ft.	= 1 yd.
$5\frac{1}{2}$ yd.	= 1 rod, pole or perch
40 poles	= 1 furlong = 10 chains
8 furlongs	= 1 mile = 1,760 yds.

Square measure

144 sq. in. (i.e. 12 × 12 in.)	= 1 sq. ft.
9 sq. ft. (i.e. 3 × 3 ft.)	= 1 sq. yd.
$30\frac{1}{4}$ sq. yd. (i.e. $5\frac{1}{2} \times 5\frac{1}{2}$ yd.)	= 1 sq. rod, pole or perch
40 sq. poles	= 1 rood
4 roods	= 1 acre = 10 sq. chains = 4,840 sq. yd.
640 acres	= 1 sq. mile

If you measure with a chain: 25 links = 1 pole, 4 poles (100 links) = 1 chain = 22 yd.

CHAPTER VII

SELECTION OF BREEDS

THE novice becomes bewildered in his choice of breed when he discovers that there are 201 varieties of large fowl, all of which are, or can be made into, bantams (plus six special bantam breeds), twenty-four varieties of ducks, ten of geese and eight of turkeys, as well as many other varieties not standardized by the Poultry Club, some of which are sound and of foreign origin, and others, boosted as new breeds, which have a hectic life, to pass quickly away for ever.

Two words cause confusion—'breed' and 'variety'. A 'breed' is a type of bird possessing the same general characteristics of body-shape, ear-lobes, numbers of toes and weight; a 'variety' is a bird of that breed differing from another variety of that breed in colour and marking. Roughly speaking, shape makes the breed, colour the variety.

As an example, the Wyandotte is the breed, the varieties being the Barred, Black, Blue, Buff, Gold-Laced, Partridge, Red, Silver-Laced and White.

THE BREEDS OF FOWLS

With the varieties, some of which are rare or obsolete

(The official breed standards and characteristics can be obtained from the Poultry Club. *Sec.*: W. H. Silk, Courts Wynde, Haslemere, Surrey.) The colours in brackets are not used in the actual name of the variety. H indicates that the breed is classed as hard feather; those not so marked are classed as soft feather.

FOWLS

Heavy Breeds

Australorp. Black.
Barnevelder. Black, silver, laced and partridge.

Brahma. Dark, light, white.
Brockbar. Gold, silver.
Brussbar. Gold, silver.
Buffbar. Gold, silver.
Cambar. Gold, silver.
Cochin. Black, buff, cuckoo, partridge, white.
Creve-Coeur. Black.
Croad Langshan. Black, white.
Dorbar. Gold, silver.
Dorking. Cuckoo, dark, red, silver-grey, white.
Essex. Golden.
Faverolles. Blue, buff, salmon, white.
Frizzle. All varieties of other breeds—black, buff, white and others.
Indian Game (H.). (Black and mahogany.)
Ixworth. White.
Jersey Giant. Black, white.
Jubilee Indian Game (H.). (White and chestnut.)
La Fleche. (Black.)
Langshan. Black, blue, white.
Malay (H.). Black-red, pile, spangled, white and others.
Malines. Blue, cuckoo and others.
Marans. Dark cuckoo, golden cuckoo, silver cuckoo.
Marsh Daisy. Black, brown, buff, wheaten, white.
Modern Game (H.). Birchen, black-red, brown-red, duck-wing, pile.
Norfolk Grey. (Black and silver.)
North Holland. Blue (barred.)
New Hampshire. Red.
Orloff. Black, mahogany, spangled, white.
Orpington. Black, blue, buff, white.
Plymouth Rock. Barred, black, buff, columbian, white.
Rhodebar. Gold, silver.
Rhode Island Red. Red.

Surrey. White.

Sussex. Brown, buff, light, red, silver, speckled, white.

Wherwell. Gold, silver.

Wyandotte. White, barred, black, blue, blue-laced, buff, buff-laced, columbian, gold-laced, partridge, red, silver-laced and silver-pencilled.

Light Breeds

Ancona. (Black and white-tipped.)

Andalusian. Blue.

Aseel (H.). Black, grey, red, white, etc.

Bresse. Black, blue, grey, white.

Cambar. Gold, silver.

Campine. Gold, silver.

Coveney White. White.

Exmoor. Blue.

Hamburgh. Black, gold- and silver-pencilled, gold- and silver-spangled.

Houdan. (Black speckled white.)

Lakenfelder. (Black and white.)

Legbar. Cream, gold, silver.

Leghorn. Black, blue, brown, buff, cuckoo, duckwing (2), exchequer, mottled, pile.

Minorca. Black, blue, white.

Old English Game (H.). Black-red, black, creel, duckwing, spangled and many others.

Old English Pheasant Fowl. Gold, silver.

Poland. Gold, silver, white, white-laced buff, white-crested blue and white-crested black.

Redcap. (Black and brown.)

Scots Dumpy. Black, cuckoo, silver-grey and dark.

Scots Grey. (Cuckoo black and white.)

Sicilian Buttercup. Brown, golden, golden duckwing, silver, white.

Sicilian Flower Bird. Mahogany, spangled.
Silkie. Black, blue, white.
Spanish. Black.
Sumatra Game. Black.
Welbar. Gold, silver.
Welsummer. (Brown partridge.)
Wyndham Black. (Black.)
Yokohama. Red saddle, white, golden, silver.

THE BEST BREED

Certain breeds have proved themselves particularly suitable for a given purpose—for example, Rhode Island Red for laying and Light Sussex for table—because they have been bred and selected for that one desirable feature over a long period of years. Here many people make a grave mistake, in that they consider that any bird of that breed must of necessity prove profitable.

It is the individual that determines success. Each breed possesses birds which vary greatly in quality. There are, for example, good-laying Rhode Island Reds and within the same breed there are extremely bad ones. Success is assured by taking every step to see that the birds (of your selected breed) you buy have been bred from parents possessing the factors you so earnestly desire. See 'Where to Buy', on p. 133.

PURES OR CROSSES

A first-cross is the progeny from the mating of two different pure breeds or varieties, such as the Brown Leghorn–Light Sussex, which have been produced skilfully for a given result; a mongrel is the result of haphazard interbreeding or mixed pures and crosses, and with no defined aim.

For the maintenance of breed quality and nucleus stock, then, the mating must be pure, but for commercial purposes, where the crosses will not be bred from, the first cross is the most profitable.

One important advantage of crossing is to increase vigour, stamina, growth-rate and resistance to disease. These qualities alone must ensure an increase of profit over the year, and for this reason I recommend the use of crosses for laying or table.

A common belief is held that first crosses lay more eggs than pures. This is not so. The inherited make-up controls production. Crosses, in laying the same number of eggs as pures, usually return a greater profit, because they are able to resist bouts of disease, the ill effects of severe weather, the faults of mismanagement and so on.

Crosses should not be bred from, because the progeny are apt to show a wide variation in quality, many being quite worthless, while others prove outstandingly good.

'The Poultry Club Book of Standards' gives details of features, colours, markings and points.

FOR LAYING

Interesting and helpful guidance as to breed popularity can be obtained by examining (*a*) the breeds and crosses kept by accredited breeders and (*b*) those entered in Laying Trials.

NUMBERS OF ACCREDITED BREEDERS IN ENGLAND AND WALES OF THE PURE BREEDS NAMED

Rhode Island Red	2,572	White Sussex	10
Light Sussex	1,395	Welsummer	7
White Leghorn	561	Buff Orpington	4
Black Leghorn	437	Barnevelder	3
Brown Leghorn	340	Brussbar	3
White Wyandotte	202	Brockbar	2
Buff Plymouth Rock	105	Cuckoo Leghorn	2
Ancona	83	Rhodebar	2
New Hampshire Red	33	Red Wyandotte	2
Blue North Holland	29	Welbar	2
Legbar	26	White Bresse	2
Barred Plymouth Rock	23	Cambar	1
Indian Game	18	Croad Langshan	1
Exchequer Leghorn	16	Grey Bresse	1
Marans	15	Houdan	1
Canadian Barred Rock	14	Old English Game	1
Black Minorca	11	White Surrey	1
Australorp	10		

THE NATIONAL LAYING TEST, 1952

No. of birds entered	Per-centage mortality	No. of deaths	Breeds	Eggs laid in 48 weeks					Total average to date
				Specials	1sts	2nds	Non-scoring	Total	
1,502	9·52	143	Rhode Island Reds	161,742	126,084	25,349	1,758	314,933	217·29
733	8·59	63	Light Sussex	64,295	59,407	14,472	957	139,131	196·58
154	11·04	17	White Wyandottes	13,884	12,518	3,373	223	29,998	201·38
91	3·30	3	Buff Rocks	6,477	9,911	2,697	140	19,225	211·89
33	12·12	4	New Hampshire Reds	3,012	2,657	403	29	6,101	201·12
20	20·00	4	Barred Rocks	2,781	851	157	8	3,797	207·68
18	16·67	3	White Sussex	1,280	1,523	298	21	3,122	177·19
6	—	—	North Holland Blues	426	579	66	2	1,073	178·84
6	—	—	D. Laced Barnevelders	758	422	21	—	1,201	200·18
6	—	—	Red Wyandottes	301	837	200	2	1,340	223·33
6	—	—	Rhodebars	173	984	107	6	1,270	211·65
6	—	—	Australorps	662	467	35	2	1,166	194·33
6	16·67	1	Marans	958	112	3	—	1,073	188·17
265	16·23	43	White Leghorns	25,011	18,931	3,722	313	47,977	196·66
248	9·27	23	Black Leghorns	25,156	18,169	3,608	268	47,201	197·73
134	8·96	12	Brown Leghorns	10,012	11,332	2,713	157	24,214	186·36
15	13·33	2	Anconas	997	1,389	112	7	2,505	168·68
12	16·66	2	Golden Legbars	755	975	226	15	1,971	170·93
6	33·33	2	Cuckoo Leghorns	682	146	13	1	842	156·42
3	—	—	Andalusians	10	140	146	54	350	116·66
3,270	9·85	322	Totals	319,372	267,434	57,721	3,963	648,490	206·07
2,587—Heavy Breeds								523,430	209·45
683—Light Breeds								125,060	193·34

ANALYSIS OF LAYING TESTS, 1939

	Open	*County*	*N. Ireland*	*Scottish*	*Total*	*Casualties*	*Percentage mortality*
Rhode Island Reds	3,886	4,161	282	162	8,491	1,337	15·75
Leghorns, White	1,314	1,025	126	138	2,603	517	19·86
Sussex, Light	905	1,481	66	66	2,518	332	13·19
Wyandottes, White	963	1,114	198	108	2,383	559	23·46
Leghorns, Black	520	280	6	18	824	124	15·05
Rocks, Buff	281	202	42	12	537	79	14·71
Anconas	134	50	6	—	190	14	7·37
Leghorns, Brown	23	57	12	—	92	6	6·52
Sussex, White	69	7	—	—	76	13	17·11
Rocks, Barred	49	6	—	—	55	4	7·27
Australorps	39	13	—	—	52	15	28·85
Orpingtons, Buff	30	15	—	—	45	5	11·11
Welsummers	14	24	6	—	44	4	9·09
Wyandottes, Red	37	—	—	—	37	9	24·32
Minorcas, Black	—	21	—	—	21	Nil	—
Legbars	10	—	—	6	16	5	31·25
Orpingtons, White	12	3	—	—	15	7	46·67
Barnevelders, D.L. and P.	6	6	—	—	12	Nil	—
Bresse, White	—	12	—	—	12	Nil	—
Leghorns, Exchequer	—	12	—	—	12	3	25·00
Marans	—	6	6	—	12	3	25·00
Andalusians	—	6	—	—	6	1	16·67
Bresse, Grey	—	6	—	—	6	Nil	—
Cambars, Gold	—	6	—	—	6	1	16·67
,, Silver	—	—	—	—	6	1	16·67

ANALYSIS OF LAYING TESTS, 1939—(*cont.*)

	Open	*County*	*N. Ireland*	*Scottish*	*Total*	*Casualties*	*Percentage mortality*
Dorkings, S.G.	—	—	6	—	12	Nil	—
Houdans	6	—	—	—	6	2	33·33
Leghorns, Buff	—	6	—	—	6	Nil	—
,, Cuckoo	6	—	—	—	6	Nil	—
New Hampshire Reds	—	6	—	—	6	2	33·33
Orpingtons, Black	6	—	—	—	6	Nil	—
Rocks, White	—	6	—	—	6	Nil	—
Wyandottes, Black	4	—	—	—	4	Nil	—
Langshans, Croad	3	—	—	—	3	1	33·33
Wyandottes, Gold-laced							
Cornwalls, Golden	1	1	—	—	2	Nil	—
North Holland Blues	1	—	—	—	1	Nil	—
Wyndhams, Black	1	—	—	—	1	1	100·00
	8,320	8,544	756	510	18,130	3,045	16·80
Ducks:							
Campbells, Khaki	103	—	—	—	103	3	2·91
,, White	29	—	—	—	29	5	17·24
Aylesburys	24	—	—	—	24	4	16·67
Runners	12	—	—	—	12	1	8·33
	8,488	9,544	756	510	18,298	3,058	16·71

NUMBERS OF BIRDS ENTERED AT RECENT LAYING TESTS

Breed	*Name of Laying Test*			
	Yorkshire Federation	*Lancashire Federation*	*East Lancashire*	*B.O.C.M. Hen Battery*
Rhode Island Reds	709	180	540	82
Light Sussex	162	94	111	27
Black Leghorns	125	81	99	—
White Leghorns	111	50	80	—
White Wyandottes	61	30	18	7
Buff Rocks	58	24	18	4
Brown Leghorns	17	21	15	—
Anconas	—	32	3	—
New Hampshire Red	—	—	18	3
Red Wyandotte	—	—	8	—

To give an idea of the industry just prior to the War, the analysis of entries at all the 1939 Open, County and Government-controlled Laying Tests is given on pp. 122–3.

First Crosses. The proved outstanding crosses are (the male given first in each case): Rhode Island Red–Light Sussex; Rhode Island Red–White Wyandotte; Brown Leghorn–Light Sussex (these three crosses being sex-linked, meaning that the sex of the chicks can be told at hatching by fluff colour); White Leghorn–White Wyandotte; Black Leghorn–Rhode Island Red and White Leghorn–Rhode Island Red.

NUMBERS OF ACCREDITED BREEDERS IN ENGLAND AND WALES OF THE CROSSES SHOWN

First Crosses

Black Leghorn × Rhode Island Red	1,588
Rhode Island Red × Light Sussex	1,002
Brown Leghorn × Light Sussex	739
Brown Leghorn × Rhode Island Red	680
White Leghorn × Rhode Island Red	487
Light Sussex × Rhode Island Red	272

Rhode Island Red × White Leghorn . .	222
Rhode Island Red × Black Leghorn . .	196
Rhode Island Red × White Wyandotte .	140
Rhode Island Red × Brown Leghorn . .	105
Ancona × Rhode Island Red . . .	67
Rhode Island Red × Ancona . . .	58
Brown Leghorn × White Wyandotte . .	51

LIST OF BREEDS

(The colours in brackets are not used in the names.)

DUCKS

Heavy Breeds

Appleyard. Silver.
Aylesbury. (White.)
Baldwin. (Black, cream and fawn.)
Cayuga. (Black.)
Magpie. (White and black.)
Muscovy. Black, white, blue, black and white, blue and white, and white winged blue, and white winged black.
Orpington. Blue, buff, black.
Pekin. (Cream.)
Penguin. (Black and white.)
Penine. White.
Rouen. (Brown, pencilled and black.)
Stanbridge. White.
Swedish. Blue.

Light Breeds

Bali. (White.)
Campbell. Khaki, white, dark.
Crested. Any colour.
Indian Runner. Black, chocolate, fawn, fawn and white, white.
East Indian. Black.

Three recently developed breeds showing promise are Welsh Harlequin, White Warwick and Leyland Ranger.

NUMBERS OF ACCREDITED BREEDERS IN ENGLAND AND WALES OF THE PURE BREEDS SHOWN

These breeds cover laying (L) *and table* (T).

DUCKS

L.	Khaki Campbell [1]	173
T.	Aylesbury [2]	147
L.	White Campbell	11
T.	Pekin	10
T.	Muscovy	6
L.	White Runner	3
L.	Buff Orpington	1
L.	Dark Campbell	1
L.	Fawn Runner	1
	Aylesbury × Khaki Campbell	1

FOR TABLE

The perfect table carcase has a long, straight, full breast, fine bone, white, unfeathered legs, and carries tender, soft, white flesh in great quantity, especially on the breast-bone and thighs. To be profitable, the table breed capable of producing that ideal carcase must be hardy, easy to rear and quick to grow.

Breed does not influence profit so much as do individuals of that breed which have been selected and bred for that supremely profitable carcase.

The outstanding pure breed is the Light Sussex; but possible close competitors, in good hands, are the White Sussex and the White Orpington. You may have heard of

[1] The outstanding breed for laying.
[2] The most popular table breed.

the value of the Indian Game (yellow flesh) or the Faverolles (feathered legs), but these are only for special inquiries, and not for making high profit from a standardized commercial article.

Prior to 1940 I turned out three hundred table chickens and handled three thousand from other producers weekly, and I must admit to my preference for the first cross for quick growth, good health and robust vigour.

There are two outstanding first crosses: the Rhode Island Red–Light Sussex and the Light Sussex–Rhode Island Red, 80 per cent of which have white legs and flesh. To break new ground, I can see value in other crosses—namely, the Light Sussex–White Sussex; Buff Orpington–Light Sussex; Marans–Light Sussex all with 100 per cent white legs and flesh.

Ducks. There is one breed *par excellence*—the White Aylesbury. Do not be led astray by the boosted qualities of other breeds. There are none others so good. If you want a first cross, then the Aylesbury–Pekin is excellent. The over-large exhibition type should not be used because of probable high infertility; nor the egg type, because body-size is lacking.

Once again introduce stock specificially bred for table purpose only.

BREEDS OF GEESE

(The weights are for young adult geese and ganders of table strain.)

Embden (16–22 lb.). (White.)
Toulouse (14–20 lb.). (Grey.)
Chinese (10–12 lb.). White, brown (or grey).
Roman (12–16 lb.). White.
English (12–20 lb.). Grey, white, buff-back, grey-back, buff.

Other interesting breeds are Brecon Buff, Sebastopol, Welsh Hill, Sex-linked, Crested, Crested Sex-linked, Canadian, Pilgrim, African and Pendle.

The two outstanding are the Toulouse and the Embden. You may be pressed to buy Chinese (most delightful creatures); but they never make weight quickly enough. The Roman may be used for crossing to improve egg production. I would suggest a cross between the Toulouse and the Embden. Whether for pure breeding or crossing, the heavy show type and the small common farm cross-bred so-called Toulouse should not be used.

BREEDS OF TURKEYS

(It is usual to give the colour name on the left.)
(The weights are for young mature females and males of table strain.)

Black (14–20 lb.). Norfolk.

Bronze (17–25 lb.). American Mammoth or Cambridge (Neater strain).

Buff (12–18 lb.).

White (13–22 lb.). Austrian or Holland (and British post-war).

Blue (14–20 lb.).

Broad-breasted Bronze (18–26 lb.). Recently introduced from America in the hope of supplying a need in Britain.

Beltsville White (11–15 lb.). Also from America for experimenting to produce the 'week-end' 6-lb. turkey.

The American Mammoth Bronze, the Norfolk Black and the Broad-breasted Bronze achieve popularity. Large size (remember the Crystal Palace winners of 42 lb.) is not desirable, because bone is coarse, the proportion of meat to bone (waste) low and the dressed carcase cannot be comfortably accommodated in the modern oven.

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The White was not liked because it was frequently confused with cheap birds imported from the Continent, but an improved type is being introduced as the British White. I fear the Beltsville White is too small for Christmas sale, but may be useful when we can convince housewives of the value of turkey-meat throughout the year.

If you want easily reared chicks and quick growth, then mate a fine-boned American Mammoth Bronze male to selected Broad-breasted Bronze hens.

GUINEA-FOWL

Here are birds capable of providing much of their own food from around the farm-yard. They need no housing. Mine sleep in greengage trees all their life. However, although admirable on the table in every way, I doubt whether they could be regarded as a commercial table-fowl in regular supply. The pearl variety is the most common and is truly handsome, but there are also lavender and white. The eggs are rich and delicious, and the meat is of a gamey flavour.

FOR EXHIBITION

Showing should not be regarded as a commercial business for profit. Whilst the recent trend of opinion is that the pure-bred possessing standard shape, size, colour and markings is likely to sell for a greater figure than the badly coloured and mismarked 'utility' specimen, the bird capable of winning in the show-pen must be bred primarily for this quality.

However, exhibiting is exciting in its way. It puts your stock before the public, it gives an added interest, and it enables you to make most valuable contacts.

When choosing a breed, one should appreciate that the popular breeds enjoy the readiest sales but meet the fiercest

competition; the lesser-known breeds are not so easy to sell but enjoy the benefit accruing from smaller entries.

BREED POPULARITY AT THE NATIONAL POULTRY SHOW, LONDON

(The figures indicate the number of entries.)

Rhode Island Red	122	Anconas	34
Old English Game (various varieties)	110	Any Other Variety	33
Sussex, Light	68	Orpingtons, Buff	31
Barnevelders	55	Sussex, Speckled	29
Welsummers	55	Wyandottes, any other colour	27
Wyandottes, White	55	Croad Langshans	25
Silkies	50	Leghorns, any other colour	25
Australorps	45	Cochins	24
Leghorns, White	45	Faverolles	24
Rocks, Buff	44	Marans	22
Leghorns, Brown	43	Sussex, any other colour	20
Minorcas	42	Orpingtons, Black	17
Wyandottes, Laced	42	Dorkings	15
Indian Game	39	Sussex, White	15
Rocks, Barred	37	Autosexing (various)	13
Blue North Holland	36	Hamburghs	11
Leghorns, Black	36	Orpingtons, White	11

BANTAMS

Bantam are miniatures of the large breeds they represent, being about one quarter the weight and following the same standards (p. 116), except for the following, which have no large counterpart:

Belgian Bearded, Antwerp and Uccle. Many colour varieties.

Booted. Black, white.

Cochin (or Pekin). Black, blue, buff, cuckoo, partridge, white, mottled.

Japanese. Black, black-tailed white, white, mottled, blue and others.

Rosecomb. Black, white.

Sebright. Gold, silver.

BREED POPULARITY AT THE NATIONAL POULTRY SHOW, LONDON

Old English Game (various varieties)	406	Ancona	55
Rhode Island Red	179	Sussex, Speckled	50
Wyandotte, White	136	Wyandotte, Black	47
Modern Game (various varieties)	108	Hamburgh	46
Sebright	105	Belgian	45
Cochin or Pekin	93	Any Other Variety	42
Sussex, Light	86	Rock, any other colour	38
Minorca	84	Wyandottes, any other variety	35
Indian Game	83	Wyandotte, Laced	27
Leghorn, any colour	79	Rosecomb	25
Rock, Barred	64	Frizzle	17
Poland	60	Sussex, any other colour	16
		Japanese	14

WATERFOWL

Goose and duck classes rarely fill well and sound specimens win the day. Popular duck-breeds are Khaki Campbell and Indian Runner, and geese, Toulouse, Embden and Chinese.

TURKEY

The favoured breeds are the Mammoth Bronze and the Norfolk Black, lesser known varieties being the Buff and the White.

WATERFOWL AND TURKEY ENTRIES AT THE NATIONAL POULTRY SHOW, LONDON

Ducks			
Campbell	44	Any Other Variety	31
Indian Runner	39	Aylesbury	23
Geese			
Embden	8	Any Other Variety	7
Turkeys			
Bronze	25	White	10
Norfolk Black	11		

FOR BREEDING

If the business is to sell stock for use by other people for commercial purposes, then it is obvious that breeds should be chosen which excel in the qualities required by your

prospective customers. The features required are explained under the headings in this chapter.

The all-important consideration is to sell stock of which you can be proud, and which, if possible, is just that little bit better than that sold by the majority of your competitors.

It will therefore be necessary for you, as the breeder, to go to extreme lengths to maintain superb breeders in your own pens. I much prefer to use home-bred birds (completely or partly unrelated) for mating, but when it becomes necessary to buy from outside, then do not buy on high price, but solely upon quality, determined: (1) by an accurate history of the birds' breeding and parents; (2) by seeing them before finally accepting them.

Do not imagine that a high-priced bird from far away is necessarily one iota superior to a bird costing less money from a lesser-known breeder in your own county.

AGES

Stock can be purchased as hatching eggs, day-old chicks, started chicks, eight-week-old chickens, three-month growers and adult birds.

Hatching Eggs. The initial cost is the lowest; but one has the trouble and possible losses of hatching with incubator or hen and of rearing with brooder or hen. If one has the flair and ability to hatch and rear, then all is well.

Day-Old-Chicks. These are the cheapest stock in a tangible form, need rearing, and are usually double the price of eggs. This is the most popular plan to-day, so long as one has confidence in one's ability to rear without heavy loss.

Started Chicks. These are three to four weeks old, costing nearly double day-old and are accommodated in brooders for one to two weeks before hardening off.

Eight-Week Weaned Chicks. These require neither incubator nor brooder, but are housed without heat in slatted

arks or growing-on houses. Commercial grade pullets cost nearly three times day-old.

Three-Month Growers. The advantage of these is that they have got over their 'teething troubles' and can be put out on range to grow on cheaply. Pullets cost approximately four times day-olds.

Adult Birds. The great asset with these is that they are mature, and thus exhibit all the qualities desired, although their price is six to eight times that of day-olds. Thus it is far easier to observe them before payment and reject any which are not suitable. Moreover, they start into profit right away.

WHERE TO BUY

One should be warned against buying from auction markets (unless at a special pedigree sale), city stalls and dealers in any shape or form.

There are only two safe vendors: (*a*) the hatchery; (*b*) the breeder; and both should be well established and successful.

Every bird you purchase must be of the quality you desire. To be safe, you should adopt the following procedure:

(*a*) Write to several breeders for particulars and to gain an idea as to their business methods.

(*b*) Visit the breeding stock to see the parents from which the stock you propose to buy were bred.

(*c*) See the stock offered you on the breeder's farm.

(*d*) Take an expert friend with you if you do not feel capable of judging.

(*e*) Bring the birds back with you, or have them sent on three full days' approval.

(*f*) Inspect again when at home.

(*g*) Accept only those you really feel are entirely suitable.

It is a fallacy to inquire from breeders living far away; it is much better to contact breeders in your county or within reach by car or train. Satisfaction and settlement of complaints are more likely from a man with whom you talk the matter over than from one who argues by post.

Names and addresses can be obtained from the County Agricultural Executive Committee (for accredited breeders), from the Poultry Club (for panel breeders), from the local Poultry Society and from the poultry press (who will now only accept advertisements from breeders who give a square deal).

BOOKS TO READ

For the history, economic qualities and precise particulars of the breeds, here are the books to study, although some are not easy to obtain:

The 'Poultry Club Book of the Standards' (giving the official standards of each breed and variety); the 'Annual' of the Auto-Sexing Breeds Association (detailing the latest in the Cambridge Auto-Sexing Breeds); the 'Book of Standards' of the American Poultry Association; 'British Poultry Husbandry', by Sir E. Brown (Chapman and Hall); 'British Poultry', by S. H. Lewer (Odhams Press); 'American Breeds of Poultry', by Frank L. Platt (*American Poultry Journal*); 'The Poultry Manual', by Rev. T. W. Sturges (Macdonald and Evans); 'Ducks', by C. Roscoe (John Crowther); 'Raising Turkeys, Ducks and Geese', by M. A. Jull (McGraw-Hill); 'Turkeys' (Ministry of Agriculture Bulletin); 'Bantams and Miniature Fowl', by W. H. Silk (*Poultry World*).

The Club governing the standards is the Poultry Club (Secretary, W. H. Silk, Courts Wynde, Haslemere, Surrey). When you have chosen your breed you should join the Specialist Club catering for that breed.

CHAPTER VIII

BREEDING AND SELECTION

SUCCESS depends greatly on your skill as a breeder or, if you buy in your stock, on your ability to purchase the exact quality of stock you desire from a sound breeder.

Breeding demands skill, knowledge, judgment, technical ability and a strong will to make the optimum decisions. It is a subject which is extremely fascinating, and demands a needful study from books.

It is important to read a simple treatise first, such as is found in 'Poultry for the Many', by W. W. Broomhead (O. F. Bates, Ltd.), or 'Poultry Husbandry', by Tom Newman (English Universities Press) or 'Poultry Breeding', by W. Powell-Owen.

For more advanced study I would recommend 'Poultry Breeding', by M. A. Jull (Chapman and Hall); 'Poultry Breeding' Bulletin, No. 146, Ministry of Agriculture; 'Heredity in Poultry', by R. P. Punnett (Macmillan).

PURPOSE

Breeding must aim at producing the most profitable birds particularly suitable for the purpose in view, and no efforts must be spared to reach near-perfection. There is no more vital task. In the past, gross carelessness and lack of ability have led to the breeding of progeny which proved a grave danger to the industry. The same may occur again, although less severe, and I would urge upon all to spare no pains to avoid mistakes, and by so doing to safeguard their own profits.

The sound breeder must have the following qualifications:

1. The ability to live long and healthily.
2. Sound stamina and a high resistance to disease.
3. To be of satisfactory body-weight.
4. To be characteristic of the breed (except with first crosses).
5. Ability to lay, or to produce progeny which will lay, eggs of satisfactory weight.
6. Ability to produce at least 85 per cent fertility when mated.
7. Ability to produce eggs which hatch at least 65 per cent chicks from all eggs set.
8. Ability to yield chicks which live and are easy to rear.
9. Ability to produce the most profitable progeny for the exact purpose desired.

One cannot afford to select for one factor to the detriment of other essential qualities. Many laying strains in the past were ruined because they were selected for supreme egg records at the expense of stamina. Let us, then, deal with each vital quality.

ESSENTIAL FACTORS

Perfect Health. No bird must ever be used in a breeding-pen if its health has been, is or is likely to be poor. We must resist the temptation to include a bird because it has proved a record layer (of, say, 250 eggs in the first year), if there is any past or future suspicion of ill-health, inherited or likely to be acquired. Such a bird must not be risked.

Particularly dangerous possibilities are bacillary white diarrhœa (B.W.D.) (inherited), tuberculosis (an inherited pre-disposition), fowl paralysis (including leukæmia) (believed to be inherited and infectious), egg peritonitis (in-

herited pre-disposition), fowl typhoid (carrier), salmonellosis (inherited) and fowl pest or Newcastle disease (infectious and carrier).

I would go so far as to keep a health record of every bird (identified by a coloured or numbered leg-band), and where one showed frequent indisposition, even of a simple nature, it would be regarded as unfit for breeding.

When selecting birds individually for health, reject those which show any of the following symptoms: swollen face; closed or watery eyes; pale or miscoloured headgear; blocked nostrils; hard-ended tongue; wart-covered comb or wattles; floury face; cheesy warts or excess mucus in throat; enlarged or pendulous crop; loosely held wings; low-held tail; abnormal vent (yellow or black deposit or scouring); water-filled or hard abdomen; enlarged foot-pad; tumours, cysts or swellings on any part of the body; thin breast-flesh; lameness or erratic gait; abnormal respiration; wattles of different length; grey-streaked eye pupil, or pin-point or angular iris of the eye.

All breeders should be blood-tested, and only those proved non-reactors to B.W.D. used.

It is likewise important to reject those with any deformity, such as crossed beak, slipped wing (flight-feathers not folding properly), bent back, wry or squirrel tail, curved or bent breast-bone, in-turned toes and partly closed eyelids.

Sound Stamina. Of equal necessity to health: no bird must be used which has an inherited weakness or any slight lack of the virility and vigour characteristic of wild birds. So many birds of proved outstanding merit in every respect other than that of stamina have been used in the past for breeding, only to throw worthless progeny and undermine the work of the previous season's selections. I can only insist that where a bird is weakly, all other good qualities

can be brought to nought. *There can be no satisfactory profit if poultry are unhealthy or weakly.*

Indications of lack of stamina are: long, shallow skull; pale comb and wattles; dull eye; loosely held wings; small body; thin flesh; excessively fine bone and frame; obvious lack of energy, and erratic appetite.

Optimum Weight. Although this is a breed characteristic, it varies considerably in strains of one breed. Size is easily lost. For example, heavy layers tend to breed birds rather smaller than themselves, and future unskilful selection will lead to deterioration of size to a dangerous degree, and with it a loss of stamina.

On the contrary, over-large birds are apt to be coarse, poor layers and excessively broody.

With the view of giving definite information, I have discussed this matter with several leading breeders, and the suggested minimum weights for breeding hens to produce sound progeny for laying purposes are:

Anconas, Leghorns and Legbars, 5 lb.; Australorps, Barnevelders, Minorcas, Rhode Island Reds, Welsummers, New Hampshires, Dorbars and Wyandottes, 5½ lb.; Marans, Plymouth Rocks, North Hollands, Orpingtons (Old Type), Indian Game and Sussex, 6 lb.; Croad Langshans, 6½ lb.; Dorkings and Jersey Giants, 7½ lb.

The weights for cockerels would be at least 1–2 lb. greater.

For ducks: Indian Runners should weigh 4 lb., Campbells 5 lb., Muscovies 6½ lb., Pekins and Aylesbury 8 lb., with 1–2 lb. more for drakes.

The weights for Embden and Toulouse geese are: 15–18 lb. and ganders 23–26 lb. In turkeys the Norfolk Black hens 12–15 lb. and cockerels 18–22 lb., American Bronze and Broad-breasted Bronze hens 18–22 lb., cockerels 25–30 lb., and Beltsville White hens 12–13 lb., cockerels 21–23 lb.

For exhibition poultry (where egg production is not the main concern) the above weights would be increased by 20 to 25 per cent.

Breed Characters. The bird to sell for the highest figure will conform to breed type, colour and markings. It is far more difficult to combine heavy egg production *and* breed characters in one and the same fowl than to select for one of these characters alone.

Until the novice stage is safely passed it would be preferable to select mainly for one character, while not neglecting the other altogether. Thus where Rhode Island Reds, for example, are selected for heavy laying, some regard would be paid to colour, and the birds with all-white undercolour or heavy black wing-bows would be rejected as breeders.

The official standards as published by the Poultry Club contain no feature which is inimical to heavy egg-laying. When inspecting some laying stock, the reason why you may find the majority of the birds poorly conforming to breed characters is because: (1) they have been selected primarily for egg-laying and (2) the combination of the qualities of eggs, breed type and colour is considered by many breeders as unnecessary and too costly for good business.

For maximum profit where stock is to be sold, some attention should, however, be paid to appearance.

Egg Weight. It has been proved that the most profitable commercial hen-egg is that weighing $1\frac{7}{8}$–$2\frac{1}{8}$ oz., because it is attractive to sell, is strongly shelled and is economical for the bird to make from weight of food consumed.

It is easy to lose egg-size, therefore the minimum weight for all eggs incubated should be 2 oz., and not heavier than $2\frac{1}{4}$ oz. because the over-large egg is not a good hatcher.

The selected breeder should have produced eggs weighing 2 oz. within one month of its first starting to lay, and have

reached the $2\frac{1}{8}$-oz. weight in its second laying year. Egg-weight is inherited, and to breed from a small egg-layer is to court disaster.

As selection for heavy production progresses, egg-size is apt to diminish and, with it, body-size. Again, therefore, one must be strong-willed and reject the small egg-layer as a breeder, even though it may have laid 280 eggs or more.

The best weight for a duck egg is $2\frac{1}{2}$ oz., goose egg 4 oz., and turkey egg 3 oz.

High Fertility. Fertility is considered to be not inherited, but is influenced by such factors as old age, severe weather, poor body condition, bad egg storage and wrong feeding. Fertility is surely of vital importance, for a hen, no matter how fine a layer, is of little value if only 40 per cent of its eggs hatch. There would appear to be considerable difference in fertility of different individuals and those with low fertility should be excluded as breeders.

Percentage fertility can best be discovered by trap-nesting and marking the eggs to the hens which laid them. Fertility can be considered good if it exceeds 80 per cent—that is, if no more than twenty eggs out of a hundred show no germ-growth after seven days' incubation.

Low fertility throughout a whole pen, assuming external conditions normal, is due to a faulty male, and he must be replaced with one held in reserve.

While not actually possible to select hens on their ability to produce highly fertile eggs, certain features may be looked for. Thus the over-fat hen (told by fat-wrinkled face, thick pelvics and rounded breast-bone) or the aged bird (more than two and a half years) are likely to be low in fertility. Unfortunately, activity and keenness are not necessarily indications of high fertility.

To assist fertility one should feed exactly correctly in quality and quantity, provide the birds with complete weather

protection, guard against frost-bite by rubbing large combs with vaseline, by mating in single pens, by fixing up mating-screens for multiple matings and by de-spurring and dubbing.

High Hatchability. This important quality is inherited, and it is not uncommon to find that the eggs from a certain hen do not hatch well. The pedigree breeder will be able to discover that hen, examine her for defects and discard her. The profitable aim is to obtain the greatest number of quality chicks from a given number of fertile eggs.

There are no external features which indicate hatchability. Close in-breeding tends to reduce it and cross-breeding to improve it. After two and a half years of age hatchability declines.

Hatchability is also likely to be reduced if the breeders are fed wrongly, are reactors of B.W.D. disease, if the eggs set are too small or over-large, or are stale and badly stored, and if incubation conditions are in any way unsuitable or incorrect.

Viability of Chicks. It is probable that chick vigour is hereditary, and that there is an inherited stamina and disease resistance. It is not unusual to find that the chicks from a certain hen are difficult to rear. Such a defect of a breeding bird acts as another means of reducing profit, and steps should be taken, by pedigreeing, to identify the bird and remove her from the pen.

Ability to Produce the Desired Stock. Breeding may be carried out to provide profitable layers, table-birds or show-birds, and they may be fowls, ducks, geese or turkeys.

Before discussing these, it is again important to emphasize that no effort must be spared to select the breeders skilfully. That there is ample scope (and work !) to produce outstanding stock is seen when one studies the many enviable characters mentioned above. There is also certain disaster ahead if one selects blindly for one factor to the loss of others of equal merit.

SELECTION OF BREEDERS

For egg-producing qualities one can either be guided by trap-nest records of the pullet year or, if these are not available (and usually they are not), by an examination of external features.

By Trap-nest Records. These records are obtained by providing each nest-box with a special front that traps the hen, which can only be released by the attendant who records the daily production, and so at the end of ninety days (three winter-month record) or forty-eight weeks (twelve lunar months) or the full fifty-two weeks—whichever record is desired—the percentage egg return can be calculated and the merits of the birds as egg-layers determined.

The final selection of the breeders is therefore definite—namely, by *first* checking up for the nine vital qualifications (p. 136), and then by studying trap-nest records. Never adopt the unsound procedure of selecting for egg records first, and for health and stamina second.

If you wish to win laying trials, remember the whole secret is to breed from the birds which have proved to breed outstanding layers, and *not* from the birds which so far have the only attribute of laying well themselves.

It is easier to find sound breeders from birds which gave a first-year egg record of 200–240 eggs than from those of records between 280 and 300 eggs. On the other hand, if one can be assured that a prospective breeder possesses the nine vital points, then it is better she laid, say, 280 eggs than 200 eggs.

By External Features. The observation of birds to discover both desirable and undesirable points is known as 'handling'.

N.B. It is important to understand that precise breeding for definite improvement within a strain over the years cannot come from external examination alone but from skilful and costly progeny testing.

Desirable features in both males and females are:

ACTIVITY. Energetic, lively and industrious.
APPETITE. Keen (feel crop at night to check up).
BACK. Straight, level and wide at shoulders.
BEAK. Short, stout and clean.
BODY. Deep and full-sided (not flat-sided).
BREAST BONE. Straight, well-fleshed and of medium length.
CHEST. Full and prominent.
COMB AND WATTLES. Soft, smooth and flexible.
DISPOSITION. Docile, but neither cowed nor nervous.
EYE. Large, bold, bright, with even coloured iris and circular pupil.
FACE. Flat, and with short feather.
FEATHER. Short, tight and narrow (not loose and profuse).
LEGS. Wide apart, medium length (not coarse and heavy).
TAIL. Carried gaily, but not squirrel or wry.
WINGS. Held high and tightly to the body.

Good text-books dealing with handling are 'The Culling of Poultry' (Bulletin No. 59 of the Ministry of Agriculture), 'How to Select the Laying Hen', by Lamon and Kinghorne (Orange Judd Publishing Co.) and 'The Call of the Hen', by Hogan and Quisenberry (American Poultry School).

Age.—Common advice is to mate a hen (two years old) to a cockerel (one year old), or a pullet (one year) to a cock (two years). In other words, mate youth with age. The better plan is to disregard age, but to mate those birds of the desired high quality, provided (and this is important) *that they are fully mature* (*if young birds*) *and fully active* (*if old birds*).

A pullet may be considered mature when it is ten months old (and possesses also a sufficiently large body, p. 203) and a cockerel when twelve months.

A hen or cock (two years old or more) may be regarded as satisfactory for mating while it still shows a youthful face, is abounding in energy and moults easily and quickly.

In fact, a valuable bird, proved to throw superb progeny, may well be bred from year by year until it shows signs of losing condition or of ageing, when it should be discarded at once.

For Table Qualities. The same general features apply with the particular requirements of long, deep, broad breast, fine bone in legs and carcase, white flesh, pale-coloured feather and a rather larger body than would be possessed by a fowl bred for egg production.

For supreme table-poultry one would have to pay less regard to egg records, for it is not easy to combine both egg-laying and table properties (both of high merit) in one and the same bird.

For Show Qualities. Selection is made first on size, type, colour and markings, as specified in the appropriate Standard. In some bred-for-showing strains egg-laying abilities are ignored. I regard this as wrong. An exhibition bird should surely be able to pay its way in eggs produced.

Ducks. It is far more difficult to select ducks by handling than hens.

For laying ducks, if trap-nest records are not available, one is forced to choose on external features.

To breed my Harper Adams Laying Trials Gold Medal winners, I selected birds which were of medium size, short of bill, large of eye (high set in the skull), neat of skull, thin of neck, tight and short in plumage, short and thin in leg, wide at shoulders, deep from back to breast-bone, full in chest and fine in bone.

For table ducks one should select first for table properties and secondly for eggs (a sufficiency for early hatching continued through to the summer, at least). To breed table

ducklings, one needs ducks which have wide, deep bodies, long breast-bones and white flesh and feather. The ideal is the large duck with fine bone.

Geese. Try to choose birds between the two extremes: (*a*) the large, coarse, feathery show winners and (*b*) the small, over-fine mongrel farm birds. The ideal breeding-goose is of medium size but deep and wide, with fine carcase bone and tight feather.

Turkeys. Again, the two undesirable types are: (*a*) the huge 40-lb. show bird and (*b*) the badly bred small farm turkey. The profitable bird is that of medium size, long of breast, fine in bone, of an active disposition and with the ability to grow rapidly as a youngster.

SELECTION OF LAYERS

One must distinguish between selection for the ability to lay and for whether a bird is in lay or not. A good bird out of lay is often confused with a bad bird in lay.

For accuracy one should take into consideration the following points: (1) breed and strain; (2) age; (3) methods of feeding; (4) type of housing; (5) health. Culling is done by comparison, and the birds under review at one time should be of the same age, breed and strain, and have been housed and fed in a similar manner.

TO TELL IF FOWL IS IN LAY

Features	*In lay*	*Out of lay*
Abdomen	Large, full, soft and responsive to the touch.	Small, sunken, hard and empty.
Activity	Energetic and active.	Dull and uninterested.
Appetite	Keen; large crop at night.	Poor, half-filled crop at night.
Comb and wattles	Large, red, soft, warm, flexible.	Small, pink, hard, cold and dry.
Pelvic bones	Two inches or more apart.	Half-inch or less apart
Vent	Large, round, quite soft and moist.	Small, oval, pigmented, hard and dry.

TO TELL IF A FOWL IS A GOOD LAYER (Fig. 27)

Features	*Good layer*	*Bad layer*
Annual moult	Late in autumn and quick.	Early in autumn, and slow.
Beak	Short and stout.	Long, thin and curved.
Body	Wide and heart-shaped.	Narrow and unbalanced.
Eye	Large, prominent, bright, high in skull.	Small, sunken, set low.
Face	Fine in skin texture, flat.	Coarse and thick, wrinkled.
Head	Round and deep.	Long, angular and narrow.
Legs	Thin, short, small scales, wide apart.	Thick, round, long, heavily scaled and close.
Pelvic bones	Thin and free from fat.	Thick and fat-covered.
Plumage	Short, tight, narrow and worn.	Long, loose, wide, profuse.

TO DETERMINE YOUTH OR AGE

Feature	*Young*	*Old*
Comb	Pliable and soft.	Thick and stiff.
End of breast-bone	Pliable.	Stiff.
Eye	Prominent and bright.	Sunken and dull.
Face	Neat and flat.	Wrinkled and coarse.
Legs and scales	Flat, clean and smooth.	Raised, loose and rough.
Pelvic bones	Pliable.	Stiff.
Spurs	Small.	Large.

MATING

Single-Pen Mating. This consists of one male and his females penned together, and gives the best results. It also enables females lacking in an essential character, such as body size or egg weight, to be mated to a male excelling in such a feature. Fertility is high and control easy.

Flock-Mating is that in which several males run together with the females. It is chiefly practised where pedigrees are not desired and where hatching is done to maintain flocks of 'commercial-quality' layers.

Double-Mating consists in using two males alternately, so that one can be rested. There is not much to be gained,

FIG. 27.—Left, head of a bad layer (Light Sussex) which produced only 91 eggs in its pullet year; right, head of a good layer (Exchequer Leghorn) which laid 201 eggs in its pullet year

but a lot of trouble and expense, in housing the separate cockerel.

Stud-Mating allows each female to be mated individually to a male kept by itself in its own house and run. Two matings per week maintain excellent fertility. This scheme can prove valuable when one becomes expert.

Males to Females. To ensure high fertility, the correct number of females should be mated to each male. For heavy-breed fowls in confined runs, allow six to eight females; on full range, eight to ten females. For light breeds, nine to twelve females in limited runs; eleven to fourteen females on range.

For ducks, good results are obtained by mating to each drake four ducks of the heavy and table breeds, five to seven of the medium-sized laying breeds and eight to ten of the light breeds.

One turkey stag is correct for eight to ten poults and one gander to three geese.

CHAPTER IX

FOODS AND FEEDING

YEARS of experience in pedigree-breeding and a heavy capital expenditure in housing may both be brought to nought through unskilful feeding. The art of feeding is to provide a fowl with that daily ration which will maintain robust health, produce the results desired at the most economical cost and with the minimum expenditure of labour.

The knowledge of how to effect this desirable result cannot be gained entirely from practical experience on the farm. It is necessary to learn the fundamentals from a text-book, which should be simple.

Suitable books to be read and to hold for reference are: 'Present-day Poultry Feeding', by Cyril Grange (O. F. Bates); 'Scientific Principles of Poultry Feeding' (Bulletin No. 7 of Ministry of Agriculture); 'Composition of Feeding-stuffs' (Bulletin No. 124); 'Feeding-stuffs', by A. S. Carlos (Chapman and Hall); 'Principles and Practice of Feeding Farm Animals', by Halnan and Garner (Longmans).

As we shall probably have to grow much of our poultry food (and it may be wise to do so) for many years, two useful publications are: 'Home-grown Feeding-stuffs' (Bulletin No. 13) and 'Arable Crops' (Bulletin No. 72), both of the Ministry of Agriculture.

PURPOSES

Above all else, the foods given must be exactly correct for the purpose in view. The foods may be for: breeders;

chicks; weaned growers; maturing pullets; moulting fowls; fattening (cockerels and hens); cramming 'Surrey' fowls; and conditioning for show.

Furthermore, poultry in the above groups will need food adjustment according to the method of housing: intensive; battery; limited runs; extensive.

Apart from fowls, some adjustments in foods are often necessary for ducks, geese, turkeys.

For entirely satisfactory results, then, one should be able to compose a formula and mix on the farm *or* buy from a merchant who has the knowledge and who enjoys your confidence.

TYPES OF FOOD

The foods and subsidiaries available are: grain, mash, pellets, potatoes, roots, greenfood, house-waste and by-products.

Accessories are: minerals, vitamin supplements, cod-liver oil, spices, condiments, grit, shell.

Grain. The important cereals are wheat, maize, oats and barley. Other grains and seeds are: buckwheat, millet, rye, home-grown maize, and sunflower.

The useful legumes (usually split or cracked for inclusion in a 'mixed corn') or ground to a meal are beans, lentils and peas; excellent as a source of vegetable protein.

Mash is a combination of meals, carefully selected and intimately mixed. Mash may be fed: (*a*) as a dry mash or (*b*) mixed with water to a crumbly, wet consistency, known as wet mash.

The important meals are middlings, bran, green grass or alfalfa meal, wheat meal, barley meal, maize meal, maize gluten meal, Sussex ground oats, pea meal, bean meal, palm-kernel meal, coconut meal, locust-bean meal, linseed-cake meal, ground-nut meal, malt culms, potato meal, fish meal, whale meal, meat and bone meal, soya-bean meal, dried milk.

Meals which should *not* be fed are flax shives meal, flax residue meal, carrot seed meal, hay meal, straw meal, mustard-seed meal, pea-haulm meal, chicory residue meal, seaweed meal, cocoa residue meal, plum-stone meal, acorn meal, beech-mash meal and horse-chestnut meal.

Excellent by-products and less common meals, with the maximum percentages to use in a mash, are: biscuit meal (30); bakery waste (30); wafer meal (30); legume-seed and herbage-seed meal (25); buckwheat meal (30); millet meal (25); tare meal (10); dried food waste (15); grass-seed meal (10); dried yeast (10); cheese meal (15); rye meal (5, unpalatable); blood meal (3).

Semi-solid foods are: Tottenham or Corporation pudding (cooked) (40); condensed fish solubles (7½ as protein); milk waste (20) and fresh slaughter-house blood (10).

High-water-content foods are: house-scraps (private or commercial) (30); fish trimmings (20); potatoes (30); roots (15); green-food (15); fresh cut, short, green grass (15); fresh brewers' grains (15); wet yeast (boiled) (15) and horse flesh (15).

Pellets are made from all mash mixtures and from green grass, activated or de-fibred grass, herbage seeds and linseed screenings.

An excellent *layer's formula* made chiefly from by-products and non-standard foods in parts by weight is: bakery waste 1½; biscuit meal 1; dried food waste ½; green grass meal ½; oatfeed ½; grass-seed meal ½; herbage-seed meal 1; buckwheat meal 1; millet meal ½; bean or pea meal ½; cooked fish waste 2; mineral mixture ½—making 10 parts in all (plus 1 per cent cod-liver oil—first mixed with the biscuit meal—for chicks, winter or intensively kept layers).

Pellets are small cubes of mixed meals $\frac{1}{16}$–$\frac{3}{16}$ in. in diameter, fed dry straight from the bag. They are less wasteful, more palatable and cleaner to handle than dry mash. They are

made by mixing the meals with molasses as the binding agent, cooking and compressing or by steaming under pressure.

Potatoes proved valuable during the War as a subsidiary food. They must be cooked and mashed, and may be fed up to 33⅓ per cent.

Fodder Beet is proving a useful poultry food for layers, 4 oz. replacing 1 oz. cereal daily or used chopped fine at 20 per cent.

Roots are useful to bulk the final mash, and should be chopped fine and fed raw. The best roots are turnips and swedes. Mangolds are useful after Christmas, but must not be fed to breeding stock. Roots may be included in a mash up to 15 per cent.

Greenfood is another bulk food which provides vitamins and minerals, and ensures an orange-yellow yolk colour. The best varieties are cabbages and kale (thousand-head and marrow-stem).

House or canteen waste is a valuable product high in food value, but must contain no soda, salt or disinfectant. Canteen waste or swill must be boiled for one hour at least (to kill possible disease germs) and mashed fine before adding to the meals up to 30 per cent.

A mineral mixture is a combination of finely ground chemical substances of vital importance to good health. A suitable mixture, which is best purchased ready mixed, is in parts by weight: Steamed bone flour, 25 per cent; common salt, 20 per cent; limestone dust, 50 per cent; ferrous sulphate, 3 per cent; and fine sulphur 2 per cent. For chicks and breeders manganese sulphate should be included at ¼ oz. to the hundredweight.

A suitable proportion is 3 per cent in the mash, which is approximately ½ oz. to 1 lb.

A *spice* is of value for making a mash appetizing, as a digestive, and possibly as a supplier of minerals.

A *condiment*, unless made by a well-known firm, is of doubtful value. It may be of use as an appetizer and some condiments contain linseed as a conditioner and cod-liver oil. Generally speaking, they are so expensive that the outlay is rarely returned in enhanced profit.

Grit must certainly be offered in boxes or hoppers from which the birds help themselves *ad lib.* The grit should be blue, sharp and pea-sized, not soft, rounded and brown. Without grit, the birds cannot digest the food properly.

Shell is also important, to enable the birds to make sound egg-shells. Oyster-shell, cockle-shell or limestone grit are of similar value, and should be fed *ad lib.* as the flint.

HOW TO ADD VITAMIN CONCENTRATES

Vitamin A. One per cent cod-liver oil (as below) or 5 per cent good quality green grass meal.

Vitamin B2. (To provide riboflavin in place of using costly and scarce foods such as liver meal, dried yeast and dried milk.) The dry supplement is added at 2 lb. to a ton or 1 oz. to 5 stone (or according to manufacturers' directions).

Vitamin B12. (Animal protein factor—to provide the essential part of protein when protein food such as fish and meat meal and dried milk are costly or difficult to obtain.) The dry supplement is added at 2 lb. to ton or 1 oz. to 5 stone (or according to instructions).

Condensed fish solubles (in thick liquid form) at 5 to $7\frac{1}{2}$ per cent are also valuable as an efficient substitute for protein (in a dry meal form such as fish meal).

Vitamin D3. One per cent cod-liver oil (approx. 1 pint per cwt. of mash) with a potency of 262,000 units vitamin A and 26,000 units vitamin D3 per pint or 2–8 oz. vitamin D3 powder concentrate per cwt. of mash (or according to manufacturers' directions).

Anti-biotic Supplements. These growth stimulants should be used as directed and only for the conditions described.

BUYING

Poultry foods may be either proprietary (that is, made by a national concern) or local (that is, made by a local miller or compounder). There is little to choose between them. Perhaps there is a closer and more personal contact if one buys locally made foods although the national concerns may have better technical advice.

Quantities. The larger the quantity bought and delivered, the lower the price. One should therefore order in fair-sized lots, provided a dry, airy, vermin-proof store is available. Long storage of grain results in little deterioration, but with mash and with kibbled, broken or cut grains the fresher it is when fed, the better effect it has upon the poultry. Cut grains and mash should therefore not have been milled for longer than a maximum of one month before being fed.

If one wishes to save money one should claim the cash discount (up to £1 per ton) by paying one week after receipt of invoice.

Straights or Compounds? A straight meal is one sold unmixed with other meals; a compound is a mixture of several meals to make a 'balanced' mash. A 'balanced' mash is one containing all the essentials in the right proportions for the purpose for which it is to be fed.

One can therefore buy the straight meals in the proportions to make a balanced mash and mix them on the farm. Much labour is entailed if one has not the use of a mixing machine.

The alternative is to purchase compounds (ready-mixed meals) all ready to feed and this I recommend, unless one rightly wishes to mix his home-grown foods.

Before the War, many poultry-keepers viewed compounds

with some suspicion, and considered that the merchant mixed inferior meals. Possibly some merchants were not too careful; but the lesson has surely been learnt. The merchant and the poultry-keeper are dependent on one another, and the closer they work in co-operation the better for the industry.

METHODS OF FEEDING

The ways in which poultry foods can be fed are as follows: All dry mash; dry mash and grain; wet mash and grain; dry mash and wet mash and grain; pellets; pellets and grain.

Method	*Advantages*	*Disadvantages*
All dry mash.	Saves labour. Hoppers filled once daily. Longer feeding time than with pellets.	Lack of variety. Mash must be complete.
Dry mash and grain.	Grain induces exercise.	Rather more labour than above.
Wet mash and grain.	Rest for digestive system. Grain induces exercise.	More labour required.
Dry mash, wet mash and grain.	Variety. Maintains appetite.	Difficult to control quantities. High labour costs.
All pellets.	No waste from troughs. Easy to feed.	Lack of variety.
Pellets and grain.	No waste. Grain encourages scratching.	Rather more labour.

Satisfactory Feed Programmes

Battery chicks . . .	Pellets *ad lib.*
Battery layers . . .	Pellets *ad lib.*
Intensive chicks . .	Dry mash (or pellets) and grain for scratching.
Intensive layers (loose litter)	Wet mash and grain or pellets with some grain.
,, ,, (deep litter)	Dry mash and some grain (or pellets).
Fatteners . . .	All wet mash plus soaked grain.
Extensive birds . .	Wet mash and grain or pellets *ad lib.*
Garden layers . . .	Wet mash.

Amounts to Feed. A laying-fowl requires approximately 5 oz. food (dry weight) per day $2\frac{1}{4}$ lb. per week, $8\frac{3}{4}$ lb. per month (four weeks) or 1 cwt. a year. When the mash is

mixed with water only, the amount per layer per day is 8 oz., but when with bulky food such as potatoes and green-food and house waste, a layer must have up to 8–10 oz. mixed wet mash daily.

One should not work to rule of thumb. Appetites vary according to weather, barometric pressure, health and breed of bird. *The secret of success in feeding wet mash or grain is to give at each feed just that amount which the birds will clear up completely within one hour of feeding it.*

With dry mash or pellet feeding the rule is to use waste-proof hopper or boxes of a size which will necessitate their being replenished only twice a week. The birds help themselves, and the food is always in front of them.

NUMBER OF FEEDS DAILY

Age of Bird	*Method of Feeding*	*No. of Feeds Daily*
Chicks (1–2 weeks)	Wet mash and grain.	Six feeds alternately.
,, (2–8 weeks)	,, ,, ,,	Four feeds alternately.
,, (1–8 weeks)	Dry mash and grain.	Three feeds grain; dry mash *ad lib.*
,, ,, ,,	All dry mash.	Dry mash *ad lib.*
Growers (8 weeks to laying)	Wet mash and grain.	Three feeds; grain, mash, mash.
,, ,, ,,	All dry mash.	*Ad lib.*
,, ,, ,,	Dry mash and grain.	Two feeds grain; mash *ad lib.*
Layers	Wet mash and grain.	Two feeds grain (2 oz. per bird). Mash *ad lib.* for one hour.
,,	All dry mash.	*Ad lib.*
,,	Dry mash and grain.	Two feeds grain (2 oz. per bird); mash *ad lib.*
Fatteners	All wet mash.	Three feeds daily (plus soaked grain).

Pellets can be used in place of dry mash and are often preferred.

N.B. Clean, unfrozen water is vital at all times, 100 layers requiring 3–4 gallons daily.

FEEDING APPLIANCES

Wet-Mash Troughs. The best type is of wood or metal, with removable wire or wooden slats to prevent the birds walking in it. The troughs must be of sufficient length and width to allow of all the birds feeding at one time without overcrowding.

Dry-Mash or Pellet Boxes. These also require slats or holes so that birds cannot walk upon the food or hook it out with their beaks.

Dry-Mash or Pellet Hoppers. When these are filled the food automatically falls down into the trough beneath. Use large-capacity hoppers to reduce time in refilling.

Grit-and-Shell Hoppers. The tall metal hoppers holding about 6 lb. upwards are best, but open boxes can be used. Grits and shell must be kept separate.

Water-Vessels. The two-gallon automatic pail is popular, although fewer drips fall from the birds' beaks if an open basin or trough is used. The water supply is best laid on from the mains automatically replenished and served in small bowl 'drinkers' like the Dewdrop.

Mixers. An indispensable appliance is a power-driven, all-purpose mixer which will mix dry or wet mash, kitchen waste or cooked potatoes, preferably with 1 cwt. capacity.

Mincers. These chop or mince roots, greenfood and raw fish. Power-driven models of ½ H.P. are to be preferred to those requiring hand labour, which just cannot be afforded when a job can be done with a machine.

Steamers and Boilers. Invaluable for cooking quickly and sterilizing swill, canteen waste, potatoes, vegetables, fish waste. Pressure steamers are of greater value than boilers of the open-pan type.

Mills. For the grower (and all poultry farmers must grow some of their food) mills are of great use for grinding, kibbling and pulverizing. Those of the hammer type are the most useful.

Greenfood Choppers. These should be of the double- or multiple-knife or double-wire type, and should be used in a wooden barrel, sawn in half.

FORMULAS

It is probable that the popularity of nationally advertised or locally produced proprietary mashes, pellets and mixtures will remain, but there will always be poultry-keepers who wish either to mix their own foods or to know good formulas. Hence the formulas given here, which are composed in accordance with the latest knowledge of nutrition and have been proved in practice to give excellent results.

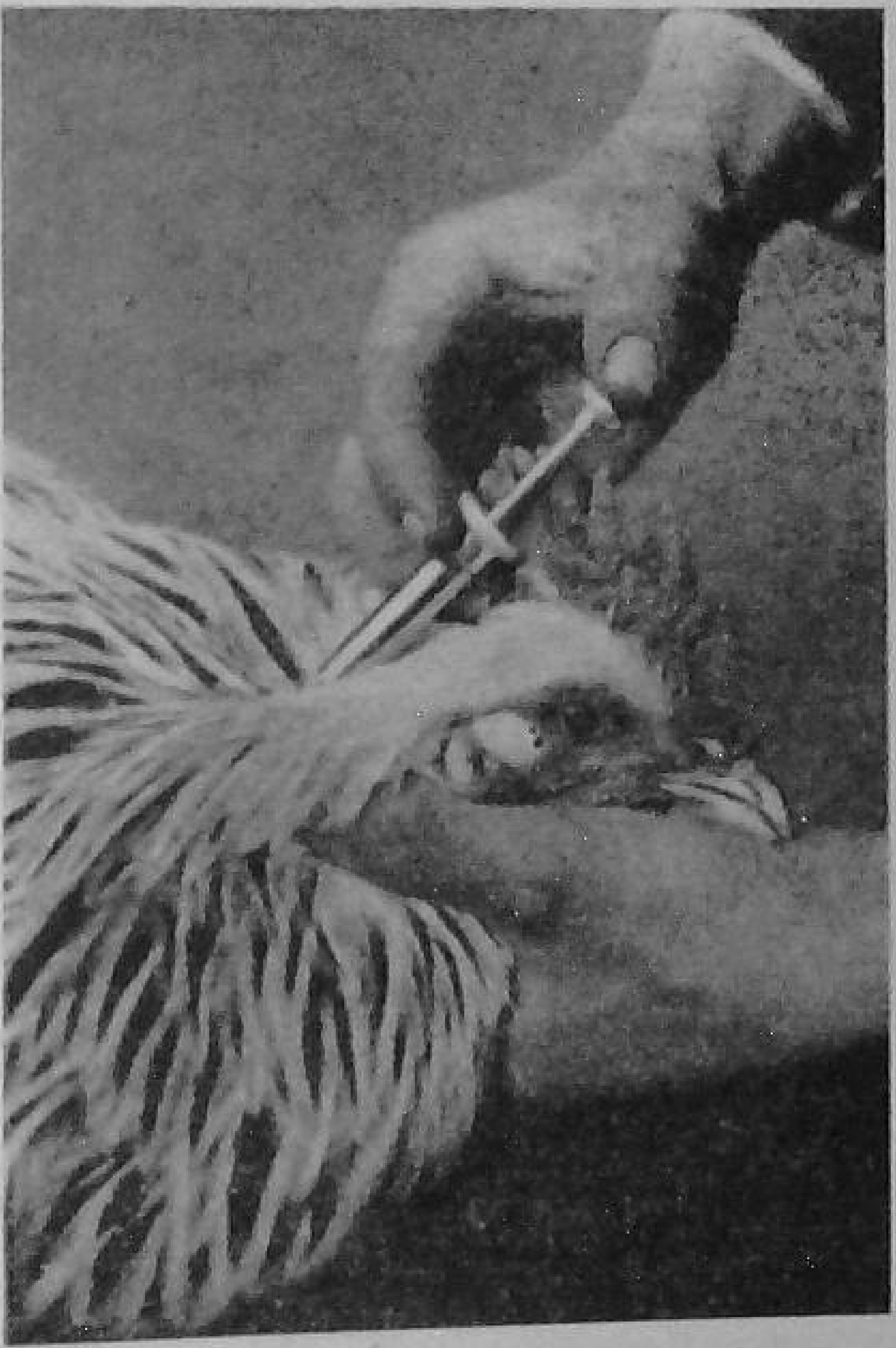


FIG. 28.—Use of an injector for implanting chemical 'caponization' tablets

Knowledge of nutrition must be kept up-to-date, and consideration should be given to reports and experiments, particularly regarding hormones, anti-biotics, animal protein factors, and vitamins which may well exert a profound influence on the efficiency of digestion and assimilation, and thus enable more eggs to be laid or weight gains in table chicken to be much greater than hitherto.

For table chicken (cockerels), use should be made of synthetic chemicals for 'feminizing' (or chemically caponizing)

such as stilboestrol of hexoestrol implanted as a pellet under the neck skin (Fig. 28).

PROVED FORMULAS

(All parts by weight)

Chicks

No. 1 Grain (for one to three weeks)		*No. 2 Grain (for three to eight weeks)*	
Fine kibbled or flaked maize	3	Fine kibbled maize	1
Fine broken wheat	4	Cracked wheat	2
Cut groats	2	Whole groats	1

Growers

(Eight weeks upwards)

Medium kibbled maize	1
Whole wheat	2
Clipped oats	2

Layers and Breeders

Summer		*Winter*	
Kibbled maize	2	Kibbled maize	4
Wheat	3	Wheat	2
Clipped oats	1	Clipped oats	1

FORMULAS FOR HOME-GROWN GRAINS

Chicks

No. 1 Grain (for one to three weeks)		*No. 2 Grain (for three to eight weeks)*	
Fine cut wheat	2	Cut wheat (medium)	1
Cut groats	1	Whole groats	1

Growers

(Eight weeks upwards)

Whole wheat	2
Clipped oats	2
Half cut barley	1

Layers and Breeders

Summer		*Winter*	
Wheat	3	Wheat	2
Clipped oats	2	Clipped oats	2
Barley	1	Barley	2
Kibbled beans or peas	½	Kibbled beans or peas	½

Buckwheat can be used in place of wheat.
Home-grown maize can be used in place of barley.

FORMULAS FOR FOWLS FOR USE WITH GRAIN (2 oz. per bird daily)

Ingredients, in cwts.	*Breeders*	*Chick (1–8 weeks)*	*Growers (8 weeks on range)*	*Layers (battery)*	*Layers (intensive, deep litter and in winter)*	*Layers (semi-intensive or free range)*	*Fattening, 14 days (trough feeding 3 wet mashes)*	*Growers (intensive or battery)*	*Limited run fattening (dry mash + 1 feed soaked layers-grain)*
Middlings	6	5	6	5	5	6	4	6	2½
Bran	2	2	3	3	2	2	—	2½	3
Palm kernel meal	—	—	1	—	—	1½	—	—	—
Green-grass meal	1¼	1¼	—	1½	1½	—	—	1¼	—
Yellow-maize meal	4	4¼	4	4½	5	5	white maize meal 4	4½	white maize meal 3
Sussex ground oats	1½	2	1¼	1	1¼	—	4	1¼	2
Barley meal	1	—	1	1½	1½	2	6	½	5
Ground wheat	1½	2	1½	1¼	1¼	1¼	½	1½	2
Groundnut meal	½	—	½	½	½	¾	½	¼	¼
Dried milk product	¾	1½	—	—	—	—	—	¾	—
Fish meal	1¼	1¾	1½	1½	1½	1¼	meat meal 1	1¼	meat meal 2
Minerals	¼	¼	¼	¼	¼	¼	—	¼	¼
Cod-liver oil	2½ galls.	2½ galls.	—	2½ galls.	2½ galls.	—	1 gall.	2½ galls.	1½ galls.

In cwts. to make 1 ton. For per cent multiply by 5.
All formulas are for use in conjunction with grain; for 'all-mash' reduce fish meal by ½ part and add ½ part yellow-maize meal.
Consideration has been given to cost and meals available without reducing efficiency.
2½ galls. C.L.O. to 20 cwt. is 1 per cent. An alternative is the dry Vitamin D_3 supplement.
For breeders and chicks, Vitamin B_2 (Riboflavin) supplement can be used in place of half or all the dried milk.
Alternative meals of similar value:

Palm kernel = coconut-cake meal.
Groundnut meal = sunflower-cake meal = soya-bean meal = maize gluten meal = linseed-cake meal.
Yellow-maize meal = maize-germ meal.
Green-grass meal = alfalfa meal = lucerne meal.
Barley meal = potato meal.
Fish meal = whale meal.
Barley meal can replace half the Sussex ground oats.

FORMULAS FOR HOME-GROWN FOODS (WITH BY-PRODUCTS) FOR USE WITH GRAIN (2 oz. per bird daily)

Ingredients	*Breeders*	*Chick (1–8 weeks)*	*Growers (8 weeks on range)*	*Growers (intensive and battery)*	*Layers (battery)*	*Layers (intensive, deep litter in winter)*	*Layers (semi-intensive and on range)*	*Fattening, 14 days (trough three wet mashes)* *	*Fattening, limited run (dry mash + one feed soaked layers-grain)*
Ground wheat (coarse)	6	7½	5	6¾	6	6½	7	4	6
Ground barley (medium)	3	2	4	3	3	4	4	6	5¼
Ground clipped oats (fine)	3½	3	4¼	3	3½	3½	4¼	5	2½
Buckwheat meal	2	1	2	1	1¼	1	—	—	1
Biscuit meal (fine)	—	1½	—	1	1	—	—	—	—
Green grass meal	1½	1½	—	1	1	1	—	—	—
Dried food waste meal	1	1	1½	1	1½	1	1½	2	2
Bean or pea meal	1	½	1¼	1¼	¾	1	1¼	2	2
Condensed fish solubles	1½	1½	1½	1½	1½	1½	1½	1	1
Mineral mixture	½	½	½	½	½	½	½	—	¼
Cod-liver oil	2½ galls.	2½ galls.	—	2½ galls.	2½ galls.	2½ galls.	—	1 gall.	1½ galls.

Alternative meals of similar value:

Buckwheat meal = millet meal = any cereal.
Home-grown ground maize or ground dredge corn can be substituted for 2 parts of any cereal.
Rye is not recommended.
Cooked and mashed potatoes at 25 per cent can be used in all above as wet mash, with addition of ½ extra part protein. For fatteners as wet mash 50 per cent potatoes can be used with 1 extra part protein.
Biscuit meal can be replaced with a cereal meal.
Where no grain is fed, reduce protein by ½ and add ½ part any cereal.
For breeders and chicks, add Vitamin B_2 (Riboflavin) supplement and half strength Vitamin B_{12} supplement.

* Use potatoes to cheapen.

Ducks and Turkeys. The rations suggested above for fowls will be entirely satisfactory.

Geese. For goslings up to four weeks the above formulas will give excellent results. From four weeks, geese must be given short fresh grass, not only to indulge their natural trait to graze, but also to cheapen the daily intake of food. The mashes may well be cheapened by the use of ingredients of similar type but lower cost; for example, maize meal for Sussex ground oats and meat and bone-meal for fish-meal.

CHAPTER X

INCUBATION

INCUBATION is the process of providing heat, moisture and air in the correct amounts to fertile eggs in order to cause development of the embyro and the hatching out of vigorous chicks.

This process is necessary if we require to hatch out chicks on our own premises. Many poultry farms use incubators; some use broody hens.

Should we wish to dispense with incubation, then we can (*a*) have our eggs hatched by a nearby hatchery (custom hatching) or (*b*) buy in our chicks from outside sources.

INCUBATOR OR HEN

Much discussion has arisen as to whether it is better to hatch artificially (by incubator) or naturally (by hen). Concisely, the arguments are as follows:

By Incubator

Advantages	*Disadvantages*
1. Eminently labour-saving.	1. High cost of installation.
2. Economical to operate.	2. Special building necessary.
3. Necessary for large quantities of eggs.	3. Brooder required to rear chicks.

By Hen

Advantages	*Disadvantages*
1. No capital outlay required.	1. Heavy labour feeding and managing.
2. Best possible results.	2. Loss of eggs (twenty-four) hen would otherwise have laid.
3. Brooder not required for rearing, as the hen also rears.	3. Risk of choosing an unreliable broody hen.

Summing up, let us suggest that incubators are used for general hatching; but a few hens may be used for hatching a small lot. You are bound to hear much argument that the chicks hatched by a hen are better than those by an incubator; but if an incubator is efficiently run, chick quality leaves nothing to be desired.

TECHNICAL ABILITY

For successful incubator operation, technical knowledge is required not only on how to hatch, but also to enable one to understand why certain results follow given conditions. Such details cannot be explained here because of exigencies of space, but a study of some of the following books will be of great assistance. 'Artificial Incubation', by W. Marshall (*Poultry World*); 'Successful Poultry Management', by Morley A. Jull (McGraw-Hill); 'Modern Poultry Husbandry', by L. Robinson (Crosby Lockwood), and 'Hatchery Management', by Hartman and Vickers (Orange Judd).

Knowledge can also be gained by joining a local poultry society and attending the lectures, or by asking a local poultry farmer to accept you as a working pupil during the incubating season (February–April).

CHOICE OF MACHINE

There are four types:

1. Small hot water (103° F.).
2. Small hot air (103° F.).
3. Flat mammoth (103° F.).
4. Cabinet (100° F.).

The temperatures shown are those which the thermometer should register when in operation.

The most efficient is the *cabinet machine*, built in the form of a small room or large box, its outstanding advantage being that every egg is assured of an even all-round temperature of 100° F. because of forced-draught heating and ventilation.

Models are made to hold 180 to 20,000 eggs, and which are

fully automatic in regard to heating, humidity and egg turning and can be had with or without built-in hatching compartments.

The *flat mammoth natural-draught incubator* is made up of several sections resembling the small hot-air machines described below, but it has now been superseded by the cabinet type. It would certainly be advisable to buy a small new cabinet rather than a cheap second-hand mammoth.

The *small hot-air natural-draught machine* is the most popular, for comparatively small lots of eggs as models can be obtained with egg capacities of 25–390 eggs.

The *small hot-water natural-draught machine* is as reliable as the small hot-air type, more economical in heating, but rather more costly to buy. It can be built up on tiers to hold 900 eggs.

To gain an idea as to appearance, size, prices and technical details, it is an excellent plan to send for and to study the catalogues of a dozen manufacturers.

METHODS OF HEATING

Incubators are heated by: (1) paraffin-oil lamps; (2) gas burners; (3) electric elements.

So long as one can be assured of a continuous and cheap supply of electricity, then undoubtedly this is the best mode of heating. It is entirely automatic, uses no air, does not foul the atmosphere with fumes, and requires no attention. In fact, the modern poultry farm should be entirely electrified.

Any type of paraffin-heated incubator can easily be converted to electric heating, either with an element fitting in the lamp chimney or with a complete heating drum which screws on in place of the existing drum. A thermostat of extreme sensibility assures the maintenance of the exact temperatures.

Where mains electricity is not available, then the incubator will have to be heated by paraffin lamps. Gas heaters never proved popular.

SECOND-HAND OR NEW

The text-books I read in 1919 warned me against buying second-hand incubators. I could not afford new ones, so I had to 'make do'—and with every success. There is nothing against buying a used machine so long as it is of a well-known make, undamaged and in good order.

It is well to obtain a book of instructions for that model from the makers. If it is one of the small, natural-draught, oil-heated machines, remove all fitments, scrub out inside with hot soda-water, then spray with disinfectant and put outside to dry. Treat egg- and chick-drawers in the same manner. Fit new sacking (hessian) to chick-drawer.

Test the thermometer in warm water alongside one of a clinical pattern, add hot water, stir round and note the reading at 103° F. Stick a label on the incubator thermometer and record on it any variation in accuracy.

Remove the heater drum from the side of the machine, clean out all flues and replace drum. Fit new mica to the chimney windows to make them airtight. If the burner is dirty, boil in soda-water. Discard wick and replace with a proper wick (usually coloured at the burning end). Test paraffin tank for leaks and discard if it is pitted. When renewing, fit the largest oil-tank possible, to save frequent re-filling.

Now for the heat-regulating apparatus. The damper suspended from the rod end must hang parallel to the chimney top. The damper rod must be a tight fit in the bearing situated on the top of the incubator, and the bearing must be freely movable without side play. Thin oil is necessary.

From this bearing to the capsule inside the egg compart-

ment is a push-rod, which must be straight, free from rust and when in position free to move without fouling its surrounding tube. It would be well to replace the capsule with a new one preferably of the double-expansion type.

See that any water-troughs or moisture devices are in good condition and that the door fits tightly and is of double glass.

By careful overhaul on the lines suggested above, the used machine will give results. If the second-hand machine purchased is a professional cabinet model, it would be wise to ask the manufacturer's expert to come down and overhaul.

THE INCUBATOR ROOM

It was in the efficiency of the incubator 'shed' that many of us failed. It cannot be stressed too strongly that the building in which the incubator is housed is as important as the incubator itself.

The features to be considered are: (1) temperature; (2) ventilation; (3) humidity; (4) size.

Temperature. A cold atmosphere outside the incubator produces a too rapid air-flow, carries with it too little moisture, leads to a wide difference in heat between the top and bottom of the eggs and makes regulation difficult.

The temperature within the room should vary no more than 20° F.—better 15° F.; but it is not easy to ensure this. The optimum range is between 60° and 70° F., and every effort must be made to keep room-heat at least 55° F. during the cold early part of the hatching season (January and February).

The ideal room or shed must therefore be:

1. Built of thick walls or insulated by lining with wall-boards and packing with shavings.
2. Insulated at the ceiling in a similar manner.

3. Restricted in window space, and double glass used.
4. Sited to prevent sun shining inside.
5. Provided with some form of heating for use in cold weather.

The capital and running cost of heating the room or shed are handsomely repaid. If possible, a form of heating which does not use up air should be used, such as electricity or hot-water pipes (with outside boiler, such as the type used for heating greenhouses).

For a small shed an oil stove or oil-heated water-pipes may have to be used; but extreme care must be taken to prevent fouling of the atmosphere. Fumes and foul air must be extracted quickly.

Ventilation. This *must* be: (*a*) into the building, low down near the floor and controllable with flaps or sliding shutters and (*b*) out of the building at the highest point in the roof. Air movement must give at least six changes of air per hour without reducing internal temperature.

Humidity. Humidity means the degree of moisture held in the air, and the best conditions are those in which the humidity around the eggs is between 55 and 60 per cent and up to 70 per cent in the last week.

Many rooms will show low humidity and to increase moisture, trays of sand (kept thoroughly damp) may be placed beneath the incubators or in the room; or if the floor is of concrete or earth, a suitable area can be swabbed daily; or a 6-ft.-high double strip of wet sacking can be suspended in the centre of the room so that its lower end is immersed in a bath of water. Moisture devices on incubators must be properly maintained.

Size. Rooms must be sufficiently large to allow of efficient working space, for the storage of eggs prior to incubation, for setting, egg testing, chick packing and sexing; also

provided with a galvanized washing-tank with hot-water supply for the scrubbing of trays and chick drawers.

EGG SELECTION

Every egg must be of tested high quality. The perfect hatching egg is:

1. Less than ten days old (better seven days).
2. Between 2 and $2\frac{1}{4}$ oz. in weight.
3. Clean (preferably unwashed).
4. Smooth, even and strong in shell texture.
5. Even and symmetrical in shape.
6. Preferably 'candled' for sound internal quality.
7. Stored on its side in a clean shed at a temperature between 50° and 60° F.
8. Collected twice daily from the breeding-pens.
9. Laid by breeding-stock of superb quality, well mated, fed and housed.

It is a common and fatal error to hatch all eggs laid. Examine each and every one and discard for the slightest blemish.

OPERATION

N.B. The practices given below are for all types of incubators with the exception of cabinet machines which, although much more simple to operate, should be operated strictly in accordance with the book of instructions applicable to that model.

New machines of the small hot-water and hot-air type are also issued with instructions, and these should be followed.

Installing. The machine should not be closer to a wall than 12 in., and should be set firm and perfectly level (testing with straight-edge wood and a level placed across the egg-drawer). Having put all fitments in place, the lamp should

be lighted. After two hours the thermometer should be inspected. If the damper has risen above the chimney top with the thermometer reading less than 103° F., then it should be lowered by turning the centre bearing-screw.

Frequent visits should be paid and adjustments made until the correct temperature is reached, when the finer temperature adjustments are made by moving the lead weight along the damper rod—nearer to the damper for more heat and farther away for less heat.

Before entrusting a machine with eggs, it must have been proved capable of maintaining an egg-drawer heat of 103° F., without an excessive height of flame.

Hatching Procedure. Having tested the machine, the egg-drawer is removed and the selected eggs are packed in rows, each egg having an *X* marked in pencil on one side and an *O* on the opposite side, to ensure correct turning. To pack the eggs conveniently, raise the egg-drawer 2 in. at one end, so that the slope thus provided prevents the eggs rolling about.

The egg-drawer need not be full of eggs, although it is better nearly so. Fresh eggs should not be added to those which are partly incubated.

After packing, the drawer is replaced in the incubator, but the door is left open for two hours to allow of gradual warming up. It is then closed, and the eggs are left for twenty-four hours. The thermometer can be readily inspected by the use of a flash-lamp. The thermometer should hang so that its bulb is $\frac{1}{4}$ in. above the top of the eggs.

The regulating apparatus should not be touched during warming-up, for it will automatically adjust itself.

The eggs should be turned three (or better five) times daily at widely spaced intervals. To save labour, all egg-drawers should be fitted with 'automatic' turning devices, which turn all the eggs in a matter of a few seconds. Some turning

arrangements are inefficient, in that some of the eggs are left up-ended at all angles. It is not necessary, however, to turn the eggs completely over.

There is no need to take the egg-drawer outside the machine for the purpose of cooling the eggs; in fact it is better not to cool.

Each morning the char is rubbed off the wick and the oil tank refilled. It is better to fit a large tank to hold enough paraffin for a week.

In hot air, but not in hot-water machines, two felts are placed at the bottom of the incubator. For the purpose of increasing air-flow, one is removed on the seventh to the tenth day, and the other on the fifteenth to the seventeenth day, the earlier times if the rate of evaporation from the egg is too slow.

On the seventh day it is wise to test the eggs to remove the infertiles and other worthless eggs, and on the fourteenth day to discard the addled eggs.

Turning ceases on the seventeenth day, after which the incubator is kept closed until the chicks are hatched. Be sure to disinfect between hatches.

Expectation. From a hundred eggs one can allow 15 per cent as infertile and 25 per cent as unhatched, leaving sixty chicks. Of these sixty chicks, mortality during rearing and growing-on may average 10 per cent, and of the remaining fifty, twenty-five may be cockerels. So that to produce one pullet at maturity, one will need to set four eggs. To be safe, one should reckon to incubate five eggs for each mature pullet required.

TURKEY, GOOSE AND DUCK EGGS

The same general incubating principles apply, with the following special adjustments. The thermometer in hot-air machines must be raised by bending the wire so that the

bulb is $\frac{1}{4}$ in. above the top of the eggs. In hot-water machines the egg-drawer is lowered by turning over or removing the wooden slats beneath it.

Egg-turning must be at least four (or better six) times daily, to ensure even heating throughout the eggs. Cease turning on the twenty-fourth day. One felt is normally removed on the tenth to the twelfth day and the second felt on the eighteenth to the twentieth day.

More moisture must be given either by increasing humidity in the room or by keeping troughs of water or pads of moist cotton wool inside the machine. During the last week (twenty-first–twenty-fourth day), in order to give direct moisture, sprinkle or spray the eggs lightly with warm water immediately after turning each morning.

Close the incubator on the twenty-fourth day, and keep closed until the youngsters hatch.

PERIOD OF INCUBATION
(in days)

Fowl	21	Goose	28–30
Duck	28	Guinea-fowl	28
Duck (Muscovy)	33	Turkey	28

EGG-TESTING

Testing is done by holding each egg in front of a bright, shaded light in a darkened room, so that the contents can be seen as shaded areas.

ON SEVENTH DAY OF INCUBATION

Good Eggs.

Fertile : distinct, pea-size, dark speck from which radiate short-blood-vessels which move when egg is turned. Air-space at large end of egg well defined.

Worthless Eggs.

Infertile : clear right through, with no dark areas.

Addled : small, confused dark spot with no blood-vessels; indistinct air-space line. The germ started to grow but has since died.

Broken air-space : small, confused, dark spot floating about egg. No air-space noticeable.

Stuck germ : small, dark spot fixed to shell.

Broken yolk : small, dark spot with a distinct immovable line across shell.

ON FOURTEENTH DAY OF INCUBATION

Good Eggs.

Fertile : dark, moving mass, size of penny, with many clearly defined blood-vessels. Air-space nearly a quarter of the way down egg.

Worthless Eggs.

Infertile : contents quite clear, indistinct air-space line.

Addled : confused, unmoving, dark mass. Chick has developed, but died.

N.B. Do not waste the worthless discarded eggs. They are valuable stock-food, but they must be boiled for one hour, and then mashed down fine. Or they may be put on the compost-heap (of leaves and garden rubbish) to rot down and form valuable fertilizer. Or they can be fed to pigs.

HATCHING DATES

Eggs should be incubated on a date which will ensure the chicks developing at the best time for the purpose in view. For example, to hatch a chick for laying too early will lead to its moulting and being out of lay in early winter ; and too

late will mean that it will hang fire and remain out of production until the late winter.

Purpose for which chicks are required	*Hatching dates*	*Advantage obtained*
Males for stock-breeding (heavy breed).	All Jan.	Full maturity assured.
Males for stock-mating (light breed).	All Feb.	To ensure mature development.
Winter-laying (heavy breed).	Feb. 15–March 15	Little danger of neck-moulting.
Winter-laying (light breed).	March 15–April 15	Continuous lay assured.
Winter-laying (light breed crosses).	April 15–May 15	Continuous winter production.
Table poultry.	Dec.–Feb. 5	For spring chicken trade.
,, ,,	July–Aug.	For Christmas poultry trade.
,, ,,	Sept.–Dec.	Early spring demand.
Ducks		
Winter laying.	March 25–May 1	Continuous autumn and winter lay.
Table duckling	Jan.–April	Spring trade.
,, ,,	Oct.	Christmas trade (limited).

Turkeys, Geese and Guinea-Fowls

Hatch all eggs as laid, because the laying season is limited to the four spring months.

Exhibition Fowls

In order to be able to show birds in 'cockerel' and 'pullet' classes, the chicks must have been hatched on or after November 1 of the previous year. It is good practice, therefore, to hatch in November or December to win the summer and early autumn shows.

HEN-HATCHING

Although the desire of a hen to sit upon eggs and rear chicks is a natural instinct, it is most essential to assist her.

Selecting the Hen. She must be of a heavy breed (see p. 117), quiet, docile, healthy, well-fleshed on breast-bone and possess the obvious natural actions necessary for good incubating.

She will be found sitting on the laying-nest at the end of a day, and she should be dusted with DDT insect-powder, and removed to the sitting-nest to prove her ability to sit close before being entrusted with eggs.

The Sitting-Box. The broody must *not* be left to sit in the laying-nest. An ideal sitting-box is not less than 14 in. wide, 12 in. deep and 12 in. high. It can be made up from boarding, or from an onion-box or small barrel (on its side), or a rearing coop.

A wooden buttoned-on front is certainly advisable, the alternative being a thick sack held down by two bricks.

If outdoors, weather-protection is afforded by covering with rubber-like felt or corrugated-iron sheeting. If indoors, the shed must be rat-free and rat-proof. The most suitable bottom is of ½-in.-mesh wire-netting which is in contact with the earth.

Making the Nest. The ideal nest is vital, and is made by placing in loose, friable, damp earth, hollowed out saucer-shaped to be 1 in. deep in the centre and 2½ in. at the edges. Upon this is a sprinkling of insect powder and a sparse covering of well-bruised straw or hay.

Setting the Hen. Having brought her from the laying-nest *at dusk*, she is placed in the nest on pot-eggs, and left until next morning, when she is fed (see below). Three days' close sitting proves her worth, and the hatching-eggs can be given her at dusk by substituting for the pot-eggs.

It is a common but bad practice to give every broody hen thirteen eggs. A small hen may cover only ten eggs properly; a large hen fourteen eggs.

Feeding. The broody hen is *not* allowed to come off and

feed at will. She is kept closed in her nest, and allowed off only once a day for feeding and relieving herself. The food should *not* be grain alone, but she should have the choice of grain, wet mash, water and shell grit.

Ten to fifteen minutes is sufficient, when she is returned and closed in. It is possible, if several hens are started at the same time, to test the eggs on the seventh day (p. 171), remove the infertiles and re-distribute the eggs among the hens, making one or more of the best-fleshed hens available for a fresh lot of eggs.

Hatching. On the nineteenth day the eggs should begin to chip, and the hen is not allowed off, but given a tin of wet mash on the edge of the nest. The hatch (if of fowl's eggs) is normally complete by the twenty-first day, on the evening of which the hen and her chicks are transferred to the rearing-coop (p. 177).

CHAPTER XI

BROODING AND REARING

'BROODING' may be regarded as the period during which the chicks are given warmth, that is, from day-old to five or six weeks; 'rearing' as the phase of life from weaning to twelve weeks; 'growing-on' from twelve weeks to maturity (laying age).

If given good chicks with inherited vigour, brooding is concerned with factors more or less completely under the control of the poultry-man. The success with which chicks are brooded will determine the annual net profit, for brooding is a fundamental operation.

Brooding *can* be dispensed with by buying in replacement stock as eight-week-old (weaned) pullets, or as three-month growers, or as about-to-lay pullets; but sooner or later chicks will be reared, and home-rearing is much cheaper than buying-in.

You will be offered a wide and varied range of gadgets and appliances; you will be recommended to try a new system; you will be tempted to discard a brooder in favour of one brilliantly described by a forceful salesman. *Do not chop and change—and do not experiment.* Also remember *success depends on the man in charge*, not on the appliance. An observant, skilful and attentive poultry-man can brood with 99 per cent success on any method, and in any brooder. If there is failure, do not blame the appliance. Try to find what error of management has been made.

CHOICE OF SYSTEM

There are six main artificial rearing methods: (1) semi-intensive; (2) fold-unit; (3) foster mother; (4) outdoor; (5) intensive; (6) battery. There is also natural broody-hen rearing (p. 192).

Semi-Intensive. This is supreme, because the chicks during bad weather may be comfortable inside the brooder-house, and on pleasant days happy out of doors.

It consists of (*a*) a small house in which is (*b*) the brooder. The house must be easily moved (to fresh ground), have a wooden floor and a well-designed front for light and sun, and be well ventilated without draughts.

The best type of brooder is the floor type (electric or oil-heated) to hold seventy-five–one hundred chicks. *N.B.* Although brooding in small units (up to one hundred chicks) is rather more costly of labour, far better results are obtained than from large units (up to 250 chicks).

The house should provide a minimum of 24 sq. ft. floor area for forty chicks from day-old to three weeks. The chicks are first allowed out when ten–fourteen days of age; but never on rainy or windy days. The best range outside is of fresh, short grass on well-drained soil beneath an orchard (not too closely planted).

Fold-Unit. This is excellent, in that it is similar to the above, but with a rather smaller brooder-house, and with a run permanently attached. There is therefore not so much area available for scratching inside in comfort.

As the run is comparatively small, the unit must be moved at least every other day, to avoid fouling of the soil.

Foster-Mother. This is the old method, but is still good. The foster-mother is a complete self-contained unit, consisting of a low wooden house (usually 2½ ft. high and 8 ft. long), in which are a brooding compartment, solid-floored

[D. McMaster & Co., Ltd., Bures, Essex

FIG. 29.—Outdoor brooders in a good environment

exercise quarters and sometimes a third compartment as a protected covered run with no floor and open to the soil.

All are under one roof, and the whole foster-mother is easily moved. Perhaps it is rather cumbersome and somewhat cramped inside: but I have seen some excellent-quality chicks brooded in these.

Outdoor. This is the newest system, and enjoyed much success when first introduced (Fig. 29). It comprises a brooder around which is built a small wooden house (about 3 ft. × 3 ft. × 3 ft.). It is the essence of economy, in that it needs the minimum of attention, and broods, through the use of wire-netting floors, the maximum number of chicks on a given area.

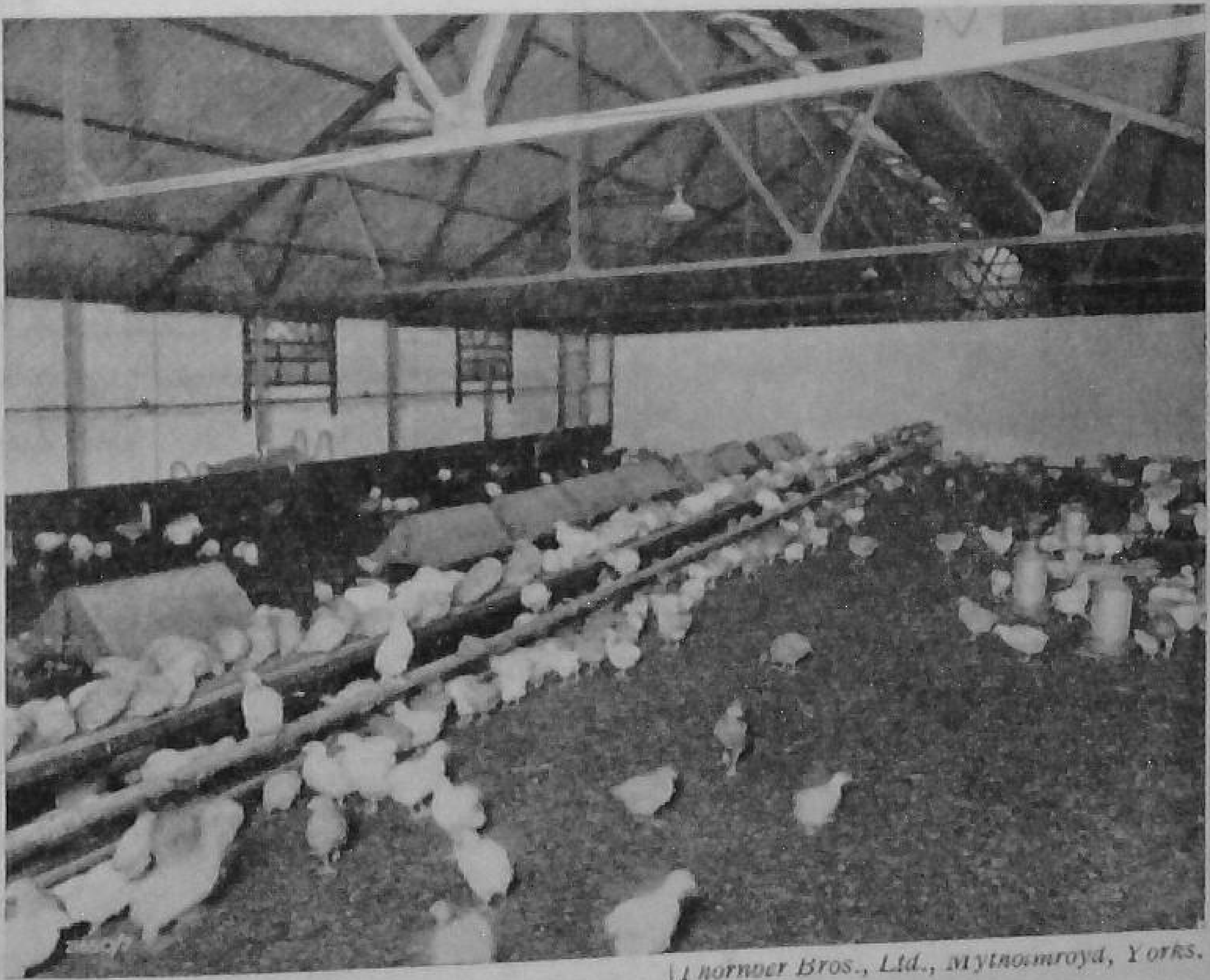
The chicks rarely have any compartment to scratch and exercise in the dry. In bad weather they remain inside,

either gorging on dry mash or idle under the brooder canopy, or they go outside to become drenched or frozen.

It is *not* a bad-weather brooder, and should not be used in early spring. It is excellent after, say, March or in pleasant weather and on sweet, short grass. It must be moved at least twice a week.

Intensive. By this method the chicks are kept inside for eight weeks, and are then weaned and put out as growers into arks. It gives satisfactory results if the foods fed are complete in every respect.

The house is permanently sited and is usually a substantial building, designed like the intensive-laying house (p. 72). It is divided into compartments, each holding a brooder and a unit of chicks. Floor brooding under the 'deep-litter' system may be given consideration (Fig. 30).



[Thornber Bros., Ltd., Mytholmroyd, Yorks.

FIG. 30.—Chickens in deep litter

The brooder may be on the floor or on legs, either single or tiered.

This system is satisfactory in expert hands, for table-poultry production or for winter or bad-weather brooding.

True intensive brooding carries the chicks on to growing-houses and then to fattening-cages. There is then no life outdoors.

Battery. This was adopted by those folks who like to mechanize living creatures. In expert hands it proves satisfactory, but difficulties occur from time to time which seem incapable of solution.

The chicks are kept either in heated brooder-cages or in a heated room, in which the cages or trays of chicks are built up in the form of tiered batteries. Installation is costly and feeding is highly scientific.

For table-chicken production under skilled supervision it will remain, but where the chicks are required to grow on as lusty laying stock, it is unsuitable.

Broody Hen. For small lots of special chicks in rat-proof coops on disease-free soil, natural rearing is useful.

BROODER TYPES

These are: (1) curtained hover, (2) non-curtained hover, (3) metal brooder, (4) legged brooder, (5) emitter radiator, (6) battery and (7) hay-box.

Curtained hover. This is square or round, lighted or dark, most popular, for oil, electricity or calor gas, and has to be used in a draught-free, rat-proof shed (Fig. 31).

Non-curtained hover. This normally has no curtains, and the old, excellent type was heated by means of a blue-flame paraffin burner; the new models are heated by radiant electric heat. Must be on a draught-proof floor.

Metal brooder. The models I have in mind are those with

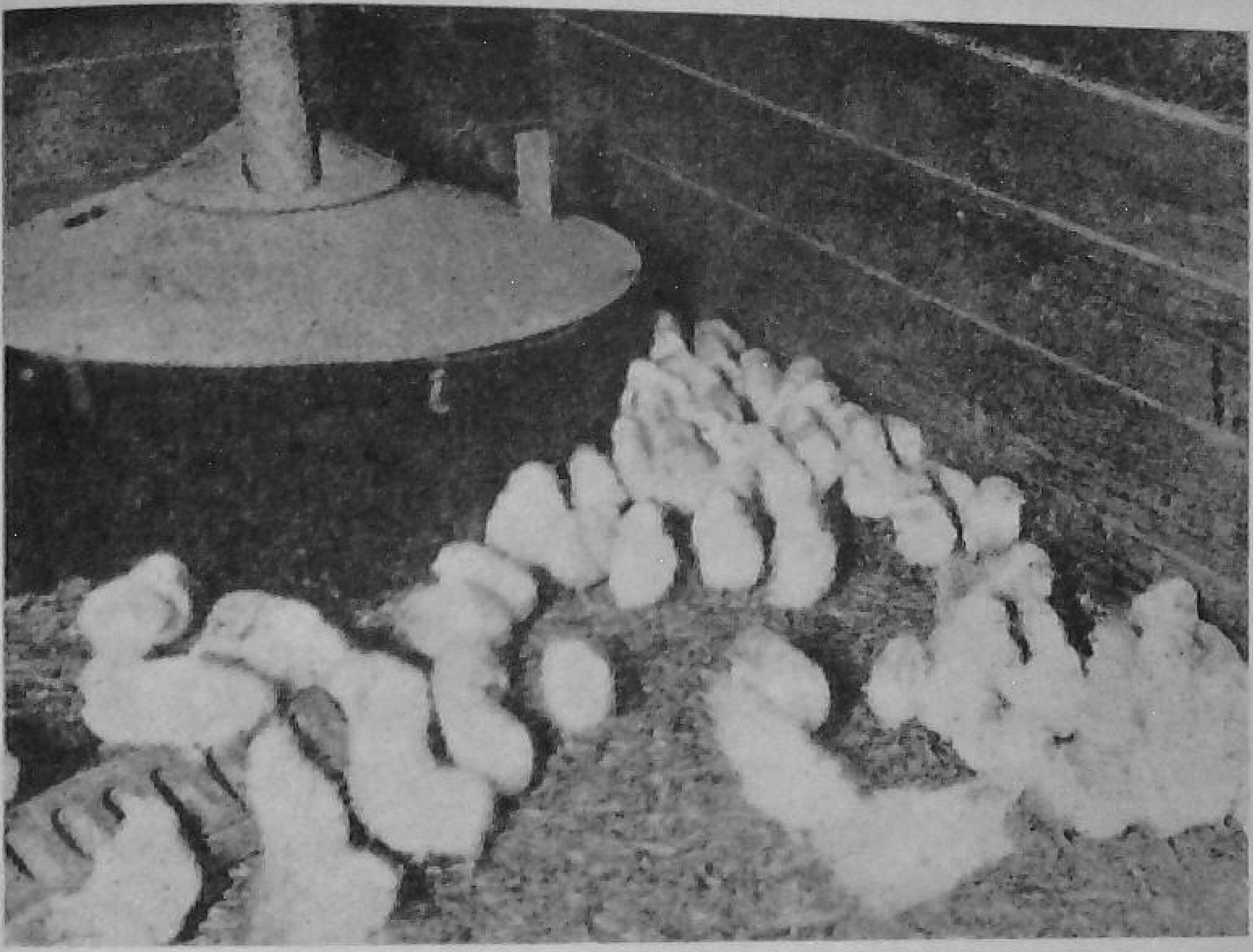


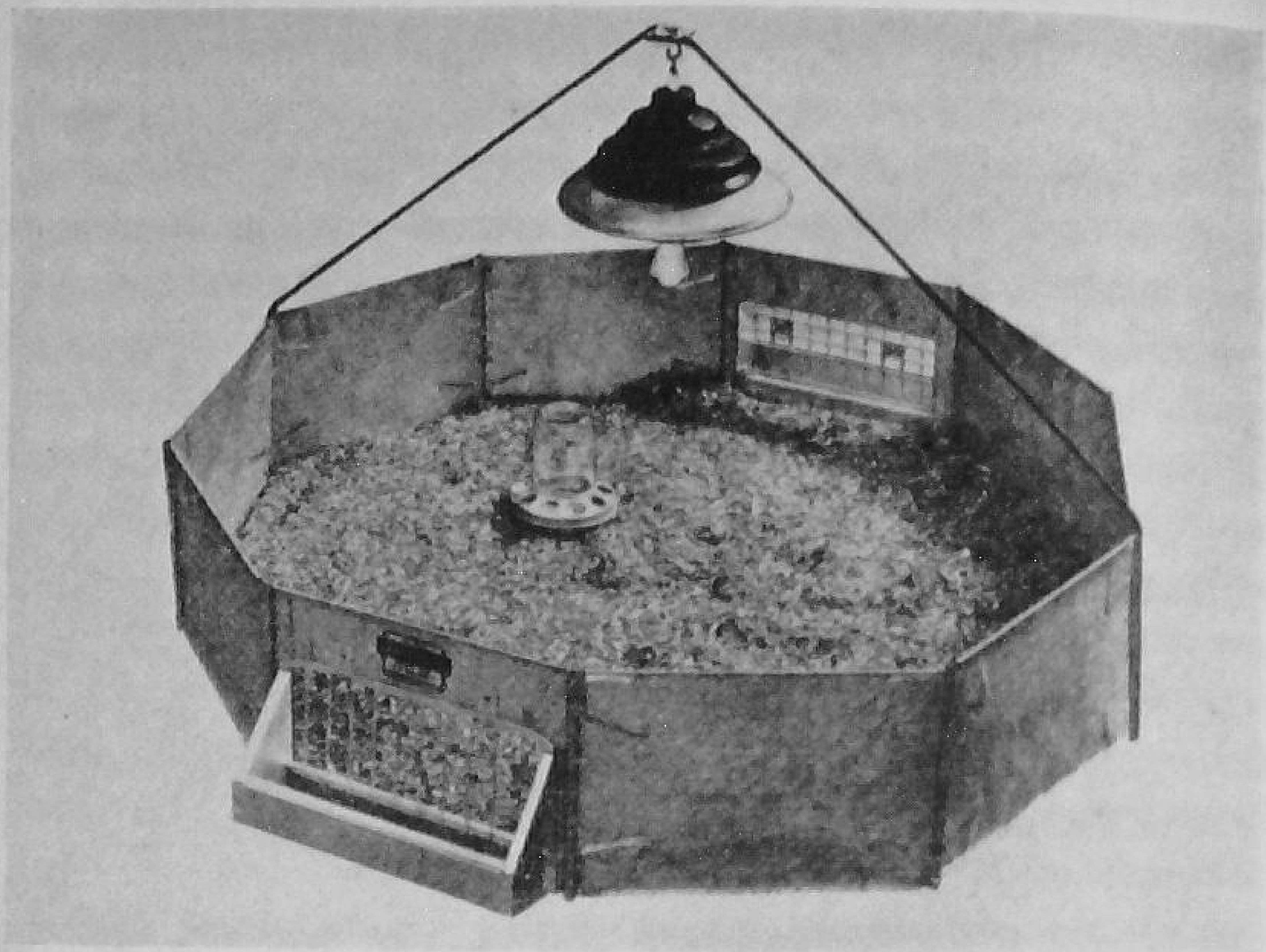
FIG. 31.—A popular curtained hover with week-old chicks

non-removable metal or wooden sides. While cheap, they are not easy to manage or ventilate.

Legged or tiered brooder. These consist of a wire-netting-floored, warm chamber and a 'double as large' feeding and drinking run, and can be tiered three deep, as a battery. Excellent in every way, but must be installed in a protected, well-ventilated shed or room. Originally heated by the Putnam's stove, but now by electric Putnam or warm floor or by electric radiant.

Electric emitter radiation. Simple and economical, bright or dull (preferred), infra-red heating elements suspended above the chicks which are in an open-topped, box-like surround 40 in. diameter for 120 chicks (Fig. 32).

Battery. Tiers of cages built up in decks, and either heated by hot-water pipes in the battery or by heated room air temperature. Usually heated by coal gas or electricity. Good in professional hands.



[Visi-Chick Brooder Co., Ltd., Colne, Lancs

FIG. 32.—A modern infra-red brooder with surround, feeding and watering troughs and properly littered to receive day-old chicks

Hay-box. The fireless brooder requiring no heat other than that generated by the chicks. Looks simple, but is really difficult.

Read about it and leave it at that.

N.B. An expert, sensible, careful man can get good results from *any* brooder.

SOURCES OF HEAT

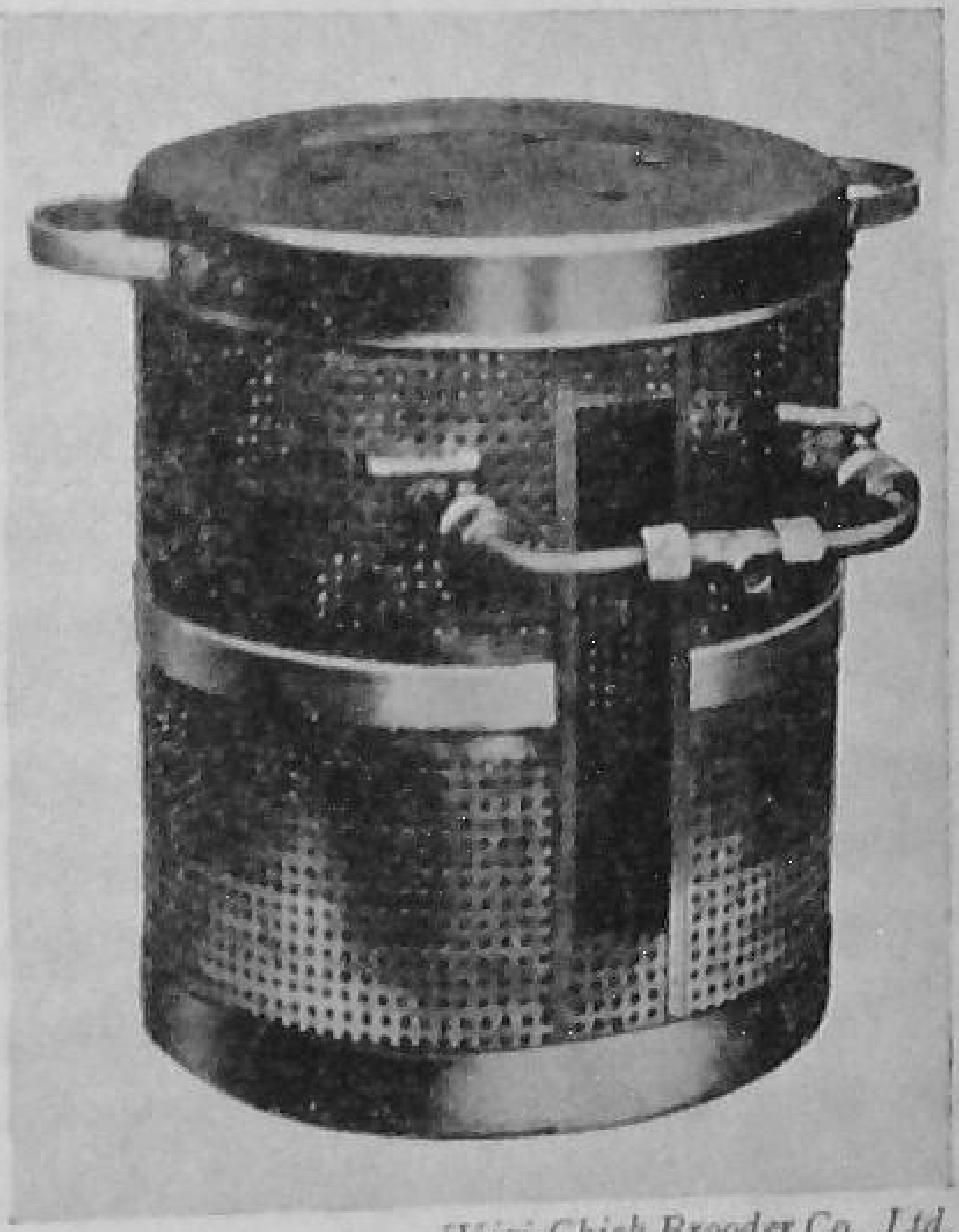
Heat is provided by paraffin, coal or calor gas, solid fuel (coal, etc.) or electricity.

If one is assured of an unfailing and cheap source of electricity, then *electric heating* it should be. It has many unique advantages. It is clean, causes no fumes, does not use vital oxygen from the air and, above all, is automatic. An outside control knob enables the desired temperature to

be maintained without attention, and a pilot light (in some models) facilitates quick inspection.

Hovers originally designed for heating by paraffin can be converted to electric heating merely by screwing on a compact conversion unit. I would recommend electric heating when possible.

Paraffin lamps (both wick and blue flame) have given entire satisfaction for many years, but constant attention in filling, cleaning and adjusting is necessary. Properly managed they are excellent.



[Visi-Chick Brooder Co., Ltd.

FIG. 33.—A brooder heater for use with calor gas

Long intensive or semi-intensive brooder-houses are often heated in each compartment by hot-water pipes and radiators fed from a boiler at the end of the building, and heated with coke or anthracite.

Heating by coal-gas is common in populous areas of large-scale production, especially with battery brooders; calor gas is useful in the country areas where neither coal gas nor electricity is available (Fig. 33).

Here are some important points. Have the brooder clean, repaired, adjusted, proved and properly warm before the chicks are put in, which should be in the morning, so that they can be watched during the day.

Do not use a thermometer. It is never fitted in the correct place, which should be 2 in. above the floor and half-way

between the source of heat and the outside of the brooder. Better be guided by the appearance of the chicks. If they are comfortable after dark, they will be evenly spaced out and quiet. If they are too cold, they will be crowding towards the heat-source. If they are too hot, they will be spread out around the limits of the brooder and will be holding their wings away from their bodies.

As a guide only, a suitable temperature for the first week is 85–90° F., for the second week 80–85° F., for the third week 75–80° F. and 70° F. up to weaning time.

The maintenance of regular and correct heat is vital, but it is better to over- than under-heat. Any chilling, even for a short period, will lead to congestion of the lungs, and those chicks which recover will be worthless.

For the first four to five days make certain that the chicks cannot leave the source of heat and then fail to find their way back when they need warmth. This is common with brooders on the floor. The correct plan is to limit range quite close to the brooder by placing a surround (of sheet metal, plywood or felt stiffened with slats), 12 in. high, around the brooder. The area enclosed can be increased each day and the 'surround' dispensed with when the chicks have learnt wisdom at seven days old.

During cold weather it is better to conserve heat by placing sacks on the top of the canopy of a floor-brooder, than to turn up the flame to an excessive height. Trouble will be caused if the lamp smokes, and there is then the danger of fire. Most fires result from filling the paraffin tank to the top. *Overfilling must never be permitted*, and the person who attends to the lamps must be given a practical demonstration on how to fill to within $\frac{1}{2}$ in. of the top.

Fire is caused by expansion of the paraffin and leakage over on to the litter, followed by a rapid flare-up. Fire need

never happen; but it is wise to keep handy a fire-extinguisher of the soda-acid type.

The successful rearer is he who observes the needs of the chicks and ministers to them immediately. Losses then will never be greater than 2 per cent.

Overcrowding is fatal. A brooder claimed to hold fifty chicks should never be given more than thirty; one to hold seventy-five, fifty chicks; 100, seventy-five chicks; 150, 100 chicks and 200, 150 chicks. As the chicks grow, so more room should be allowed.

Contrary to the 'back to Nature' enthusiasts, it is not wise to let chicks go outside before they are ten days old, except with the outdoor brooder when they have to endure the elements at a few days. Nor should the chicks be driven outside. Let them find their way out, and choose a calm day for their first experience of outdoor conditions.

Important. The range for the chicks must be that which no poultry of any type has been allowed on for the previous six months. Twelve months is preferable, and can be arranged with duplicate runs.

With all brooders other than battery, it is a grave mistake to attempt to heat the house outside the brooder. The area beneath the brooder must be amply warm, but the house air around it must be at the same temperature as the outside air, and absolutely fresh, but without draughts.

Littering. Brooders on solid floors need litter both under them (1 in. deep) and on the house floor (½ in. deep). The best litter is clean, dry, dust-free, cut straw-chaff, because it encourages exercise by scratching when chick-grain is scattered in it.

The longest-lasting, most absorbent litter is fine peat-moss; but the danger lies in not appreciating when it should be renewed.

The litter must be kept deeper under the brooder than

outside, and it must touch the brooder curtains where used. Each night, therefore, it is wise to push in some litter from outside.

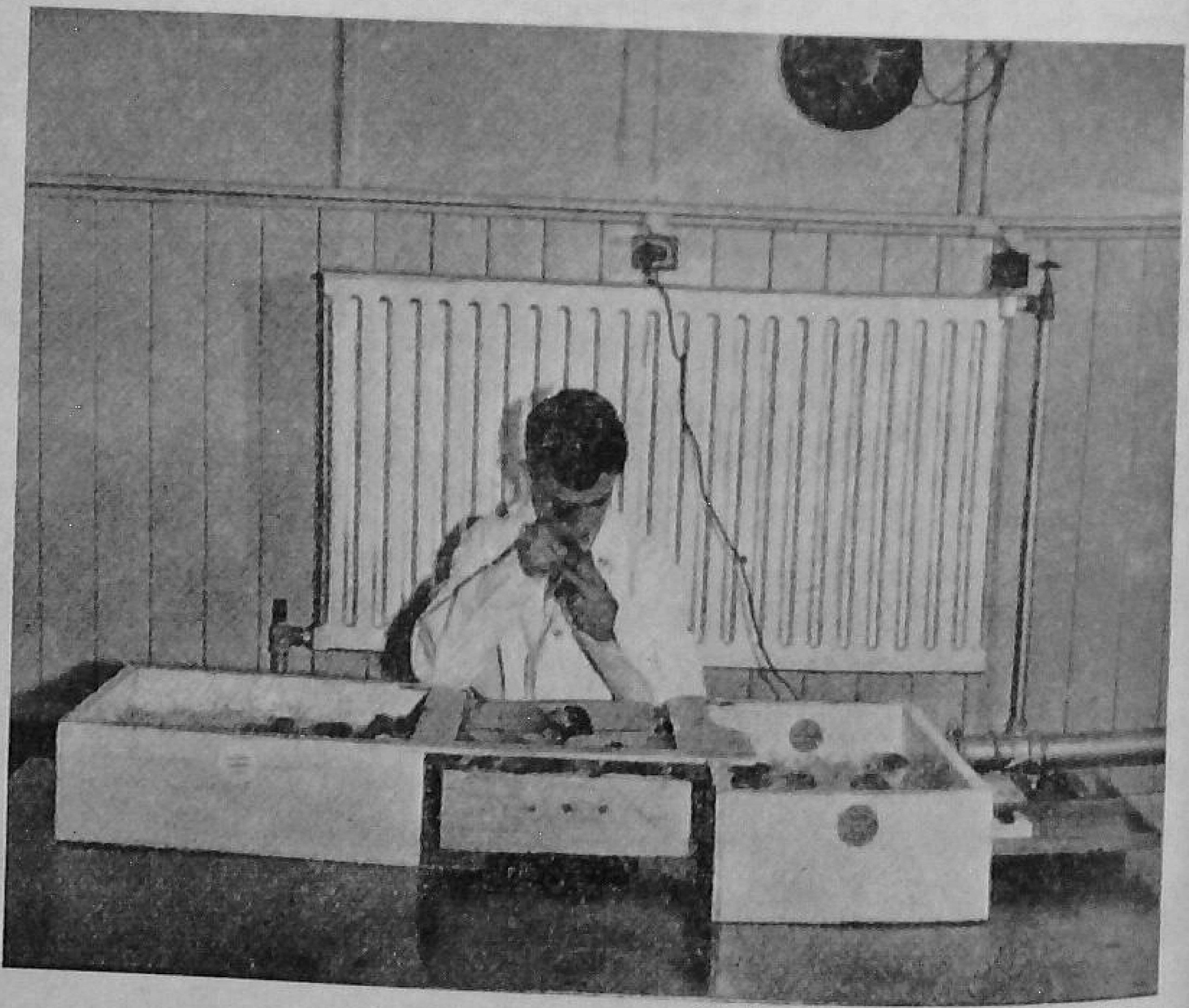
Feeding. Troughs of the correct size and length, and water-founts of quart capacity, must be provided.

N.B.—To reduce outbreaks of coccidiosis, stand the water-vessel on a low platform of ½-in.-mesh wire-netting, so that the damp litter beneath cannot be reached by the chicks.

For feeding systems see p. 154 and for chick foods p. 158. For superb results give skimmed milk as well as water to drink.

WEANING

Weaning means removing the chickens from the source of warmth. No exact age can be given. Weaning should take



[*Hallmark Hatcheries, Wickford, Essex*

FIG. 34.—An electric chick-sexing machine in action showing the lay-out in a modern hatchery

place when the chickens obviously show that they no longer need warmth, that is, when they sleep around the edges of the brooder.

Weaning in January should be arranged when the birds are seven to eight weeks of age; in May five to six weeks old.

At weaning, the first thorough culling and sorting are given. Each bird is individually handled and examined. Males are separated from the pullets; worthless birds killed or sold for what they will make for table. This culling should never be omitted.

Sexing (Fig. 34). The identification of the sex of day-old chicks can be done by observing:

1. Down colour. } Sex linkage.
2. Leg colour. } Sex linkage.
3. Wing-feather length. } Sex linkage.
4. Physical examination of the vent.

Good books on vent sexing are 'Sexing Day-old Chicks', by W. P. Blount (*Poultry World*) and 'A Guide to Sexing Chicks', by C. S. Gibbs (Orange Judd).

Method	*Examples of breed or cross*	*Male signs*	*Female signs*
Down colour (gold–silver)	Rhode (male) × Light Sussex.	White or cream down.	Brown, red or buff down.
Down colour (unbarred–barred)	Rhode × Barred Rock.	White spot on head.	Top colour black.
Down colour (auto-sexing)	Legbar or Cambar (pure).	Pale, indistinct.	Darker, defined dark areas.
Leg colour (dark–light)	Legbar × Rhode.	Light-coloured legs.	Dark-coloured legs.
Wing-feather length (rapid–slow)	Light breed × heavy breed. Leghorn × Rhode.	No wing-quills.	Wing quills $\frac{1}{8}$ in. long.
Vent (so-called Japanese)	Any breed or cross (needs skill and practice but the new electric machine will help).	Eminence—raised, large, rounded, firm and reddish.	Eminence—flat, small, pin point, soft and pale.

SEXING OF GROWING PURES

	Male	*Female*
Light breeds.	Larger and brighter comb and wattles.	Smaller and paler headgear.
Heavy breeds.	Stout and long legs. Short, cobby body. Backward slow feather. Short tail. Large and brighter headgear.	Firm, neat and short legs. Long, shallow body. Rapid, profuse feather. Long tail. Small, pale, backward headgear.

Housing. The finest house in which to transfer the chickens from the brooder is that with a *slatted floor*, whether a night ark or a fold unit or an out-of-use slatted-floored laying-house.

Solid-floored houses may be used, but their disadvantages are that they are not so economical, they usually need special perches or droppings-board and they are not easily moved. If a solid-floored house must be used, then make a slatted platform ($\frac{3}{4}$-in. slats $\frac{3}{4}$ in. apart) 9 in. high and stand it on the floor for the birds to sleep on.

The slatted-floored houses must be on clean, short grass range, and they must be moved every other day; or they can be fitted with slatted- or wire-floored 'parlours' for intensive use. Watch must be kept for overcrowding, and the pullets must be well away from the cockerels.

Growers six weeks of age should be allowed $\frac{1}{2}$ sq. ft. slatted floor-space per bird, and at twelve weeks $\frac{3}{4}$ sq. ft.

At weaning, the chick-mash is discontinued and the birds are fed a growers' mash; but the change-over should be gradual, using an intermediate mash of both meals in equal parts.

During the growing on from eight weeks to maturity watch out for coccidiosis, intestinal worms and fowl paralysis (see Chapter XIII).

Progress Charts. The figures are carefully compiled from averages on several good farms, but certain factors will cause alteration, and these must be considered.

PROGRESS CHART: LIGHT BREEDS

Example: Leghorns (laying strain), Semi-intensive, Dry Mash

Age in weeks	*Males*						*Females*					
	Food consumption per bird				*Body-weight*		*Food consumption per bird*				*Body-weight*	
	Per week		*Cumulative*				*Per week*		*Cumulative*			
	lb.	*oz.*	*lb.*	*oz.*	*lb.*	*oz.*	*lb.*	*oz.*	*lb.*	*oz.*	*lb.*	*oz.*
1		2¼		2¼		2½		2¼		2¼		2½
2		4¼		6½		3¼		4¼		6½		3¼
3		5½		12		5		5½		12		5
4		6	1	2		6½		6	1	2		6½
5		9	1	11		10		8	1	10		9
6		11	2	6		12		10	2	4		11
7		13	3	3	1	0		12	3	0		14
8		15	4	2	1	3		13	3	13	1	0
9		15	5	1	1	7		13	4	10	1	3
10		15	6	0	1	12		14	5	8	1	6
11	1	1	7	1	2	0		15	6	7	1	9
12	1	1	8	2	2	3	1	0	7	7	1	12
13	1	3	9	5	2	6	1	1	8	8	1	15
14	1	5	10	10	2	9	1	2	9	10	2	2
15	1	7	12	1	2	13	1	4	10	14	2	5
16	1	10	13	11	3	0	1	6	12	6	2	8
17	1	12	15	7	3	2	1	6	13	12	2	10
18	1	12	17	3	3	6	1	7	15	3	2	12
19	1	13	19	0	3	8	1	9	16	12	2	15
20	1	14	20	14	3	11	1	9	18	5	3	3
21	1	11	22	9	3	15	1	8	19	13	3	6
22	1	12	24	5	4	5	1	7	21	4	3	10
23	1	12	26	1	4	11	1	8	22	12	3	14
24	1	13	27	14	5	0	1	9	24	5	4	3

PROGRESS CHART: HEAVY BREEDS

Example: Rhode Island Red (laying strain), Semi-intensive, Dry Mash

Age in weeks	*Males*						*Females*					
	Food consumption per bird				*Body-weight*		*Food consumption per bird*				*Body-weight*	
	Per week		*Cumulative*				*Per week*		*Cumulative*			
	lb.	*oz.*	*lb.*	*oz.*	*lb.*	*oz.*	*lb.*	*oz.*	*lb.*	*oz.*	*lb.*	*oz.*
1		2¼		2¼		2½		2¼		2¼		2½
2		5		7¼		4		5		7¼		4
3		6¼		13½		6		6¼		13½		6
4		7½	1	5		8		7½	1	5		8
5		10	1	15		12		9	1	14		11
6		13	2	12	1	0		12	2	10		15
7		15	3	11	1	5		13	3	7	1	2
8	1	0	4	11	1	10		15	4	6	1	6
9	1	2	5	13	1	15	1	1	5	7	1	10
10	1	4	7	1	2	4	1	2	6	9	1	13
11	1	6	8	7	2	10	1	3	7	12	2	0
12	1	7	9	14	3	0	1	3	8	15	2	4
13	1	8	11	6	3	4	1	3	10	2	2	8
14	1	9	12	15	3	8	1	3	11	5	2	11
15	1	10	14	9	3	12	1	5	12	10	2	14
16	1	10	16	3	4	0	1	6	14	0	3	3
17	1	12	17	15	4	4	1	8	15	8	3	6
18	1	14	19	13	4	8	1	9	17	1	3	10
19	2	0	21	13	4	12	1	10	18	11	3	14
20	2	0	23	13	5	0	1	11	20	6	4	2
21	1	14	25	11	5	4	1	11	22	1	4	5
22	1	12	27	7	5	8	1	9	23	10	4	9
23	1	14	29	5	5	12	1	9	25	3	4	13
24	1	14	31	3	6	0	1	10	26	13	5	2

PROGRESS CHART: MIXED SEXES

Age in weeks	Light Breed (*mixed sexes*)						Heavy Breed (*mixed sexes*)					
	Food consumption per bird				*Body-weight*		*Food consumption per bird*				*Body-weight*	
	Per week		*Cumulative*				*Per week*		*Cumulative*			
	lb.	*oz.*	*lb.*	*oz.*	*lb.*	*oz.*	*lb.*	*oz.*	*lb.*	*oz.*	*lb.*	*oz.*
1		2¼		2¼		2½		2¼		2¼		2½
2		4¼		6½		3¼		5½		7¾		4
3		5		11½		5		6¼		14		6
4		6	1	1½		6½		7½	1	5½		8
5		9	1	10½		9		10	1	15½		11½
6		10½	2	5		12		12	2	11½		15½
7		12	3	1		15		14½	3	10	1	3
8		14	3	15	1	1	1	0	4	10	1	8
9		14½	4	13½	1	5	1	1½	5	10½	1	12
10		15	5	12½	1	8	1	2	6	12½	2	0
11	1	1	6	13½	1	11	1	2½	7	15	2	5
12	1	1	7	14½	1	14	1	3	9	2	2	10
13	1	1½	9	0	2	2	1	4	10	6	2	14
14	1	2	10	2	2	5	1	6	11	12	3	0
15	1	2	11	4	2	8	1	7	13	3	3	4
16	1	3	12	7	2	12	1	9	14	12	3	9
17	1	6	13	13	2	15	1	10	16	6	3	12
18	1	8	15	5	3	2	1	12	18	2	4	0
19	1	10	16	15	3	4	1	14	20	0	4	4
20	1	11	18	10	3	6	1	14	21	14	4	6
21	1	11	20	5	3	8	1	14	23	12	4	10
22	1	9	21	14	3	13	1	12	25	8	4	15
23	1	9	23	7	3	14	1	14	27	6	5	4
24	1	10	25	1	4	0	1	14	29	4	5	9

Food consumption will be:

Increased

1. If disease is allowed to break out.
2. If food is bulky or fibrous.
3. If the system is intensive (no range).
4. If weather is cold.

Decreased

1. If grass range is allowed.
2. Management is of a high order.
3. Environment is especially good.

Body weight will be:

Increased

1. If selected birds are being used for table.
2. If maturity rate is slow.
3. If the lessons learnt concerning newer nutrition are applied (that is, antibiotics).
4. If birds are of an exhibition strain.

Decreased

1. If disease breaks out.
2. If there is any overcrowding.
3. If food is unbalanced or fibrous.
4. Management is inefficient.

BROODY-HEN REARING

As with sitting (p. 173), the hen must be assisted to rear her chicks, and not left to her own devices.

The coop must provide a dry floor, ventilation without draughts, ample space and protection from all vermin. Use of the once-popular apex type with no front and stood upon a sack results in weakly chicks and high mortality.

The ideal coop is 24 in. wide, 20 in. deep, 22 in. high at the front and 16 in. high at the back. The front is 2-in. slats, 2 in. apart, over which is a removable wooden shutter covered for 6 in. at the top with ½-in.-mesh wire-netting. The coop has a sliding wooden floor and a removable run 9 in. high, 3 ft. long, to fit the coop-front.

The best position is on short grass on well-drained soil, and on the south side of a protecting hedge.

It is prepared two days before required. The floor is littered with clean, dry, cut chaff or fine peat-moss to a depth of only ½ in.

Transference. Only when all chicks are dry and fluffed up (at the end of the twenty-first day of hatching) should they be moved to the rearing-coop after dusk. The chicks are taken from the pen and placed in a hay-lined box (draught-proof). The hen is then lifted up and carried with the box of chicks to the prepared coop.

If the hen has any lice upon her (look beneath abdomen

feathers), dust with insect-powder, not D.D.T., to the skin *and* then brush out with the fingers as much dust as possible. It is dangerous for chicks to be placed beneath a hen's feathers that are heavily charged with powder.

Having put the hen in the coop, place the chicks beneath her and close up for the night.

Feeding. The first feeds are best given on brown paper or cardboard, placed just in front of the hen, so that she can teach her charges to feed. After three days the food is offered in small chick-troughs and water in one-pint founts. After five days the chicks will be strong enough to go outside the coop, when they are fed at the end of the run, away from the hen.

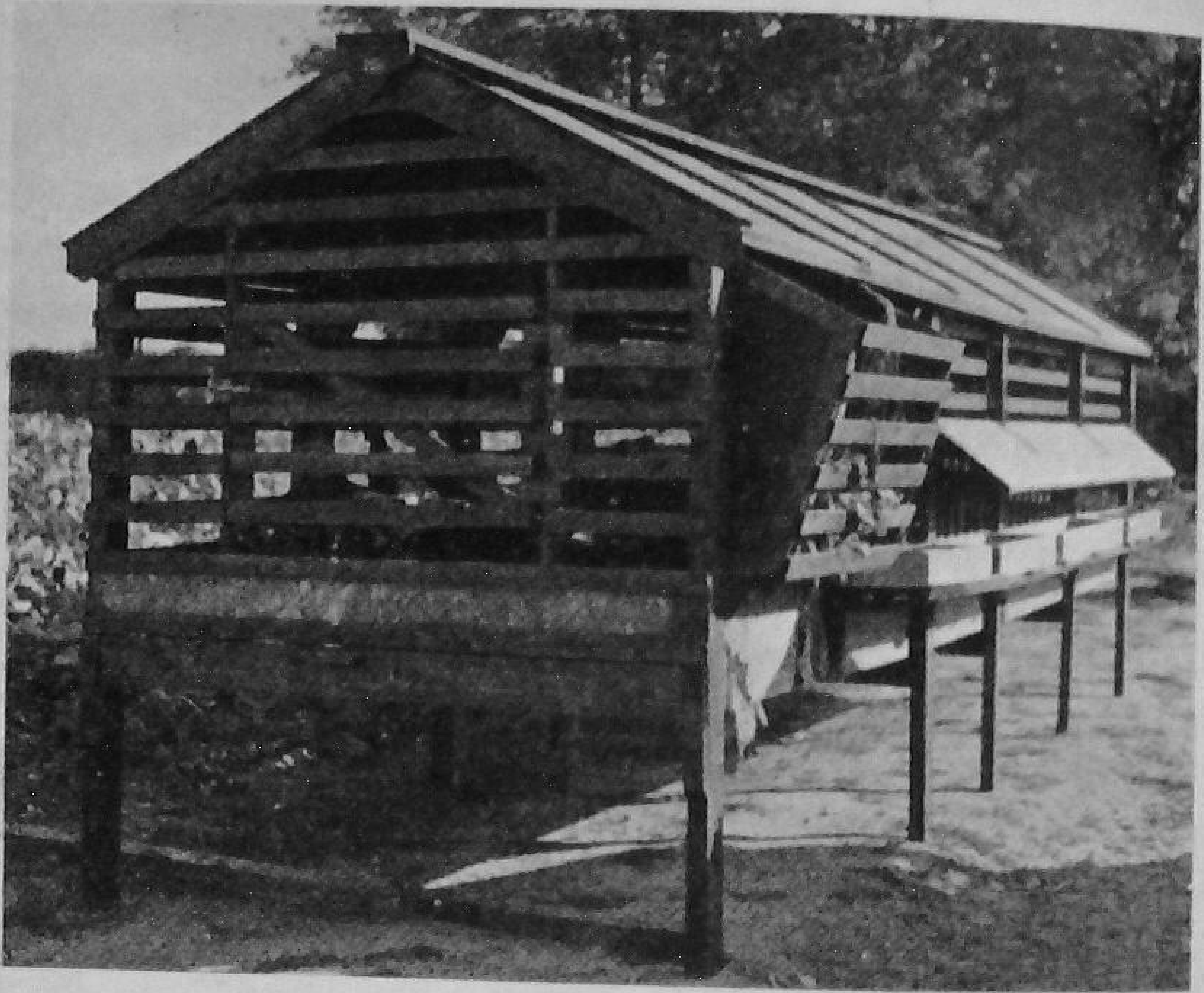
The hen should not eat the chick's food, nor the chicks' the hen's food. Therefore the food for the hen is given in tins either placed upon the run batten (at the coop-front) or hung on a nail in a slat so that the chicks cannot reach it.

Feed the hen twice a day, and the chicks according to the system preferred (p. 154). For chick-mashes see p. 159.

Do not be in a hurry to dispense with the chick-run. When the chicks are a week old will be soon enough. *Move the coop daily*, and preferably forward. Do not let the hen out until the chicks are fourteen days old, and then only if no other hen is in the same run.

Beware of letting chicks wander to another coop of chicks of different ages or colour, for the 'stranger' hen will kill them.

When the chicks are seen to sleep away from the hen (usually at from four weeks onwards), then the hen may be taken back to her laying-house. The chicks may be left in the coop by themselves, but if there is any overcrowding they *must* be thinned out by moving to a larger house.



[D. McMaster & Co., Ltd., Bures, Essex

FIG. 36.—An intensive unit for turkey rearing

the fingers. It is a good plan to hatch some ordinary chicks at the same time and rear them with the turkey chicks.

Give skimmed milk (as well as water) to drink and once a day mix the wet mash, if used, with milk.

Do not be in a hurry to wean them, but pay careful attention to crowding, as they are much larger than chicks.

Otherwise follow the chick routine implicitly (Fig. 36).

CHAPTER XII

MARKETING AND SALESMANSHIP

As poultry adviser, I have visited during the past thirty years poultry farms of all types and sizes, and I gained the impression that most of the owners took little interest in marketing, put no value on publicity, showed no enthusiasm for salesmanship and paid scant attention to a simple but sufficient system of accounts.

I must insist that the business side of poultry farming is as important as the production part, but I do see outstanding examples of enterprise in this direction during the post-war expansion.

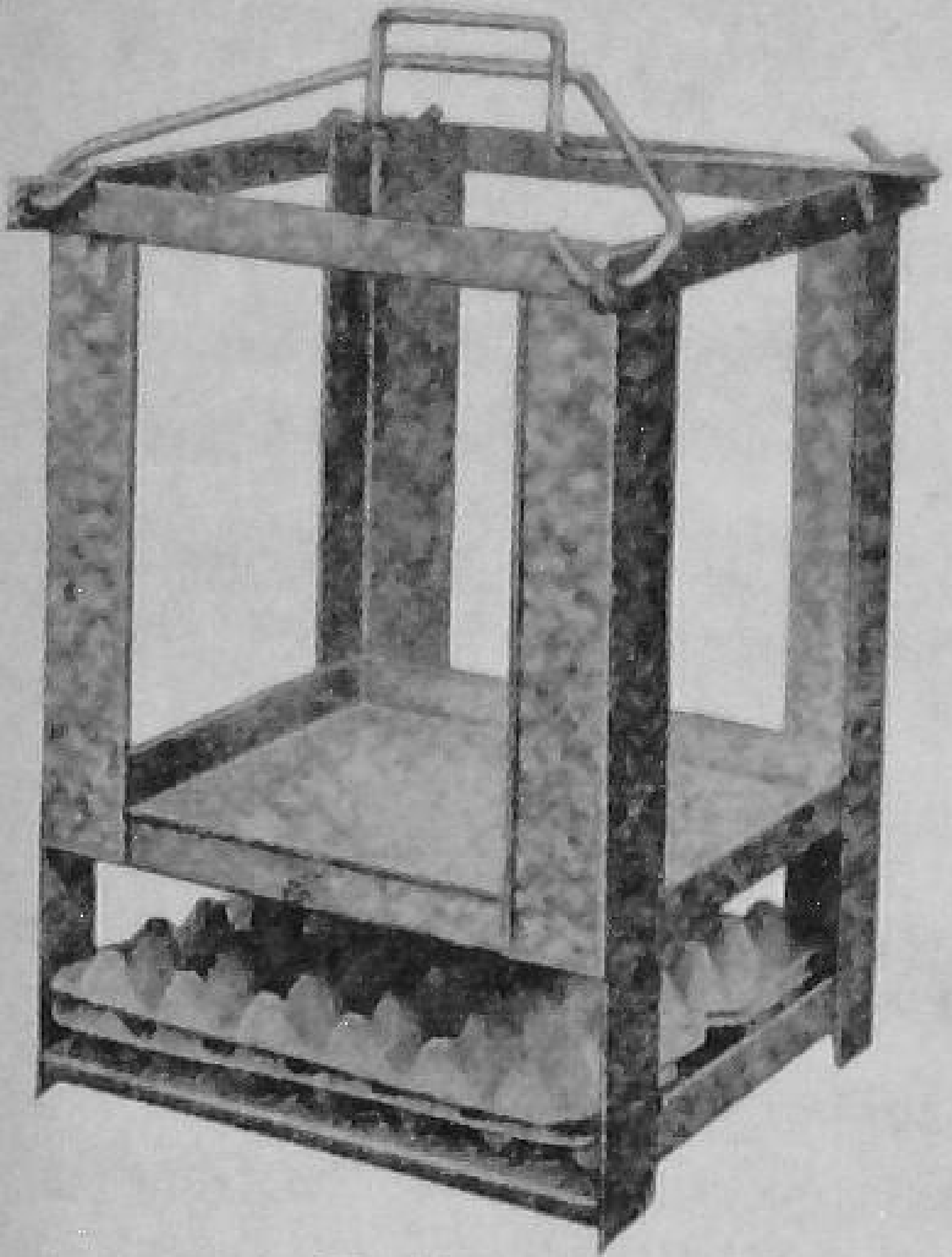
Net profits can definitely be substantially increased if our products are marketed in an attractive manner; if we maintain a live programme to offer our goods in a pleasing way to our buying public; if we attract and make sales with a view to repeat orders; if we 'keep books' so that at any time we can obtain a true picture of our financial position.

Some useful information may be found in an American book 'Marketing Poultry Products', by Benjamin and Pierce (Chapman and Hall, Ltd.).

I am afraid that the personal details which mean so much to us as poultry farmers must be learnt by studying, here and there, the obviously enterprising and novel methods of people in our business. This culled knowledge, together with our own common sense and initiative, should do much to lead to our farm and methods being singled out as outstanding.

EGGS

Supplies are best handled by officially recognized 'packing stations'. Some of the eggs received by packing stations are dirty (especially during rainy periods), bad (collected from hedgerows), 'sat-upon' (due to broody hens being allowed to remain on laying-nests, cracked (through careless handling) and mouldy (laid in damp, filthy nests) (Fig. 37).



[*Swifts of Scarborough Ltd.*

FIG. 37.—A modern egg-carrying crate

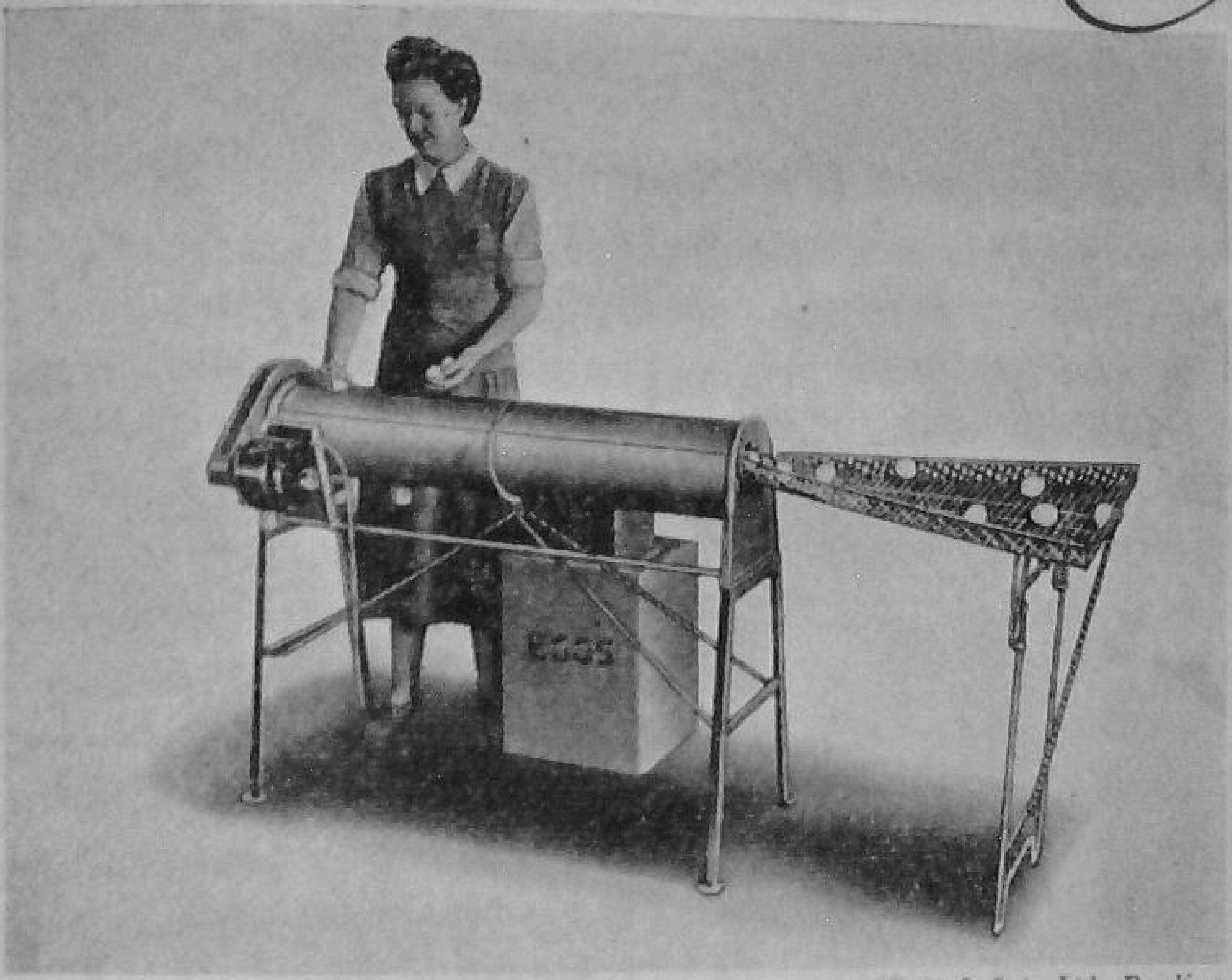
Although the packing station does the grading and marketing on our behalf, it is certainly up to us to send in only clean fresh and good-quality eggs (Fig. 38). We shall obtain more money for them and suffer no deductions from the maximum price.

To understand how and why eggs are tested for quality, you should read the Ministry of Agriculture's booklet 'The Testing of Eggs for Quality'.

Packing stations (Fig. 39) are only too willing to demonstrate how eggs are candled, graded and packed and how an egg which appears perfect from the outside may be quite inedible within.

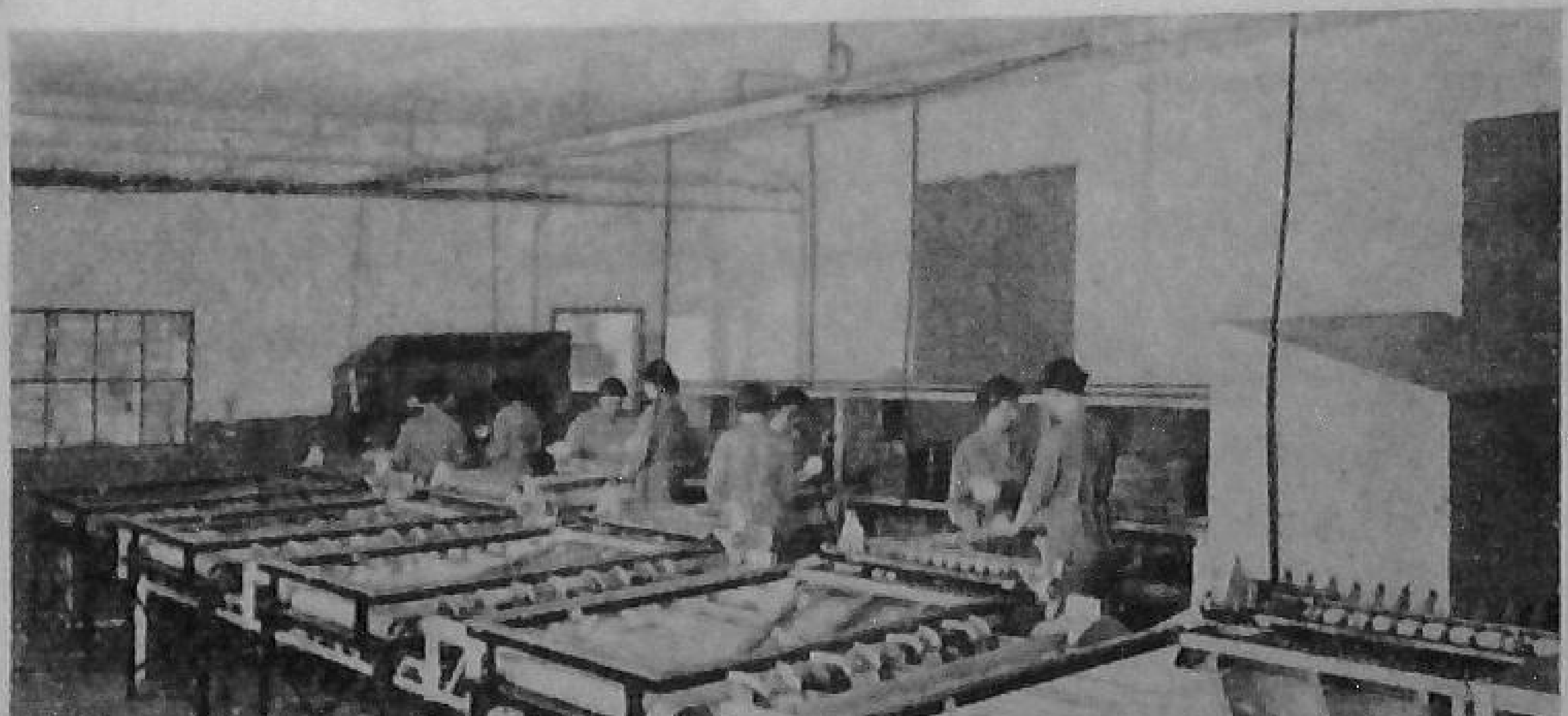
A 'first-quality' egg must not have been preserved by any process and must be free from taint; the shell must be clean, sound, of good texture and shape. The contents must be free from blemish, the yolk central and translucent or faintly but not clearly outlined. The white must be translucent, and the air-space must not exceed $\frac{1}{4}$ in. in depth.

Let us send in first-quality eggs for which the maximum price is paid.



[Cope & Cope Ltd., Reading

FIG. 38.—A power-driven egg-cleaning machine (40 eggs per minute)



[United Dairies Packing Station, Moreton-in-the-Marsh

FIG. 39.—Egg-packing

A group of 'Ben-Nevis' two-track grading machines in operation

TABLE-POULTRY

The part the producer has to play (for his own benefit) is to produce poultry carcases of the highest quality, of the optimum weights, of the most acceptable colour, in the most attractive manner and at the most appropriate times.

Quality is assured if:

1. Breeders of the right type and shape are used of the best strain of breed or cross.
2. The chicks are reared and grown on without check.
3. The table fowls are fattened correctly.
4. Starving, killing, plucking, stubbing (Fig. 40), cooling, shaping and tying are carried out in the right manner (if not on the farm, then at the packing station) (Fig. 41).

Table-poultry production is a specialist's job, and requires technical knowledge. Visits to poultry-packing stations and processing plants will teach the producer best what the trade requires.

[*Comb Pluckers Ltd., West Moors, Dorset*

FIG. 40.—A modern stubbing machine

Suitable text-books are 'Table Poultry Production', Bulletin No. 18 Ministry of Agriculture; 'Table Poultry Production', by Macdonald and McMurray (Harper Adams College); 'Experiments in Table-Poultry Production', Bulletin No. 91 of the Ministry of Agriculture; 'Report on the Marketing of Poultry', Economic Series, No. 11, Ministry of Agriculture, all of which will have to be found second-hand.

However, the latest post-war bulletin, free from the

{Esso Petroleum Co., Ltd., London, S.W.1

FIG. 41.—Wax plucking

Left, carcase dipped in wax which rapidly solidifies to enable feathers to be pulled off in masses; right, the carcase plucked and left clean

Ministry of Agriculture Marketing Division, 36/38 Chester Terrace, London, N.W. 11, is 'Marketing Guide No. 41 for Dressed Poultry', which details the recommended voluntary grading system.

The graded designations are: first-quality (Grade A Prime), second (B) and third (C). The classes are: poussin (single to $1\frac{3}{4}$ lb. live weight, and double $1\frac{3}{4}$–$2\frac{1}{2}$ lb.); chicken (roaster) ($2\frac{1}{2}$ lb. minimum); Surreys (4 lb. minimum super-fatted); fowls (hens) (boilers) $3\frac{1}{2}$ lb. and over, with a 'special' grade for soft battery hens which will roast; duck-lings $4\frac{1}{2}$ lb. and under ten weeks old; young ducks $4\frac{1}{2}$ lb. and over ten weeks; young geese ($8\frac{1}{2}$ lb. and over); young turkey hens and cocks.

To obtain the greatest proportion of first-quality birds must be the producer's aim, and the attributes of all varieties of poultry for table are wide, long, full, straight, unbroken breast, heavily covered with soft flesh, as also are the thighs; fine neat bone and carcase; fine texture and smooth,

undamaged skin, and free from any discoloration or blemish. Heavy-breed cockerels must be under seven months, and pullets under five months, if they are to be classed as chickens, and must have a soft, flexible cartilage (pelvics and end of breast bone). Producers make the common mistake of holding a cockerel until it gets 'staggy' or a pullet until it nears lay, when both have to be sold as cocks and hens (boilers) at a much lower price.

Table-fowl should preferably be white in flesh, pale in feather, and unfeathered in legs.

Quite apart from quality table-poultry produced specially for the table-poultry trade, there is a large number of surplus cockerels, used breeding-cocks, culled pullets and old hens discarded as unprofitable from the commercial poultry farm, which naturally should be plumped up and marketed in an attractive condition.

DAY-OLD CHICKS

Chicks enjoy a popular demand because they offer stock in a more certain form than sitting-eggs. Indeed, the trade in sitting-eggs is now chiefly confined to the more expensive pedigree sittings.

Pedigree chicks are usually priced at double that of sitting eggs, but 'commercial-quality' chicks have their own prices, as dictated by (*a*) the cost or value of the hatching eggs, (*b*) the demand for the chicks, (*c*) the period or date when produced and (*d*) the intrinsic quality of the breeding-stock.

Payment is strictly cash on invoice, which is sent seven days before the despatch date.

A 'sex-linked' pullet is one from a sex-linked mating (for example, Rhode Island Red × Light Sussex) (see p. 124); a 'sexed' pullet is one sexed by examination of the organs; 'as-hatched' means both cockerels and pullets (unsexed) as they come from the incubator.

Customer-satisfaction is assured by:

1. Publishing an attractive chick list.

2. Operating a simple effective booking and invoicing system.

3. Selecting only first-class chicks for despatch.

4. Despatching on the exact date and time booked.

5. Using strong, well-ventilated boxes, properly packed with hay or wood wool on which is printed your name and address.

N.B.—To safeguard yourself from possible lawsuit, be sure to print the 'Terms of Sale' and 'Conditions and Warranties' on your list and memo paper. These conditions will be found on the lists of all hatcheries, which lists should be perused for other ideas which you could make use of in your own way.

GROWING PULLETS

There is a steady trade for eight-week or twelve-week or about-to-lay pullets, especially from domestic poultry keepers and farmers. They are reared on the poultry farm from your own eggs or from bought-in day-old chicks.

Important selling features are:

1. To ask for bookings well ahead (three months, if possible).

2. To despatch on the exact date and time booked.

3. To send only really first-class pullets of the breed ordered.

4. To use for preference non-returnable cardboard boxes (specially made).

First quality is denoted by:

1. Well-grown.
2. Well-fleshed on breast.
3. Strong on legs.
4. Even in size.
5. Free from deformity.
6. Clean in feather.
7. Bold and brilliant of eyes.
8. True to breed, colour and shape.
9. Absolutely free from disease.

If it is desired to work up a specialized trade in pullets, publish an attractive list setting out the reasons why your pullets can be relied upon and make your prices offer the best value for money.

STOCK SIRES

These are cockerels bred specially for sale for mating to produce really good stock (Fig. 42). Every bird sold must be abounding in vigour, sound in size, of satisfactory breed, colour and shape and possess in its pedigree those qualities desired by your buyer.

High prices are realized for pedigree sires with an individual history of their parents, but this entails trap-nesting.

Where pedigree or high-class breeding is carried out on the farm, then the sales of sires must be regarded as an

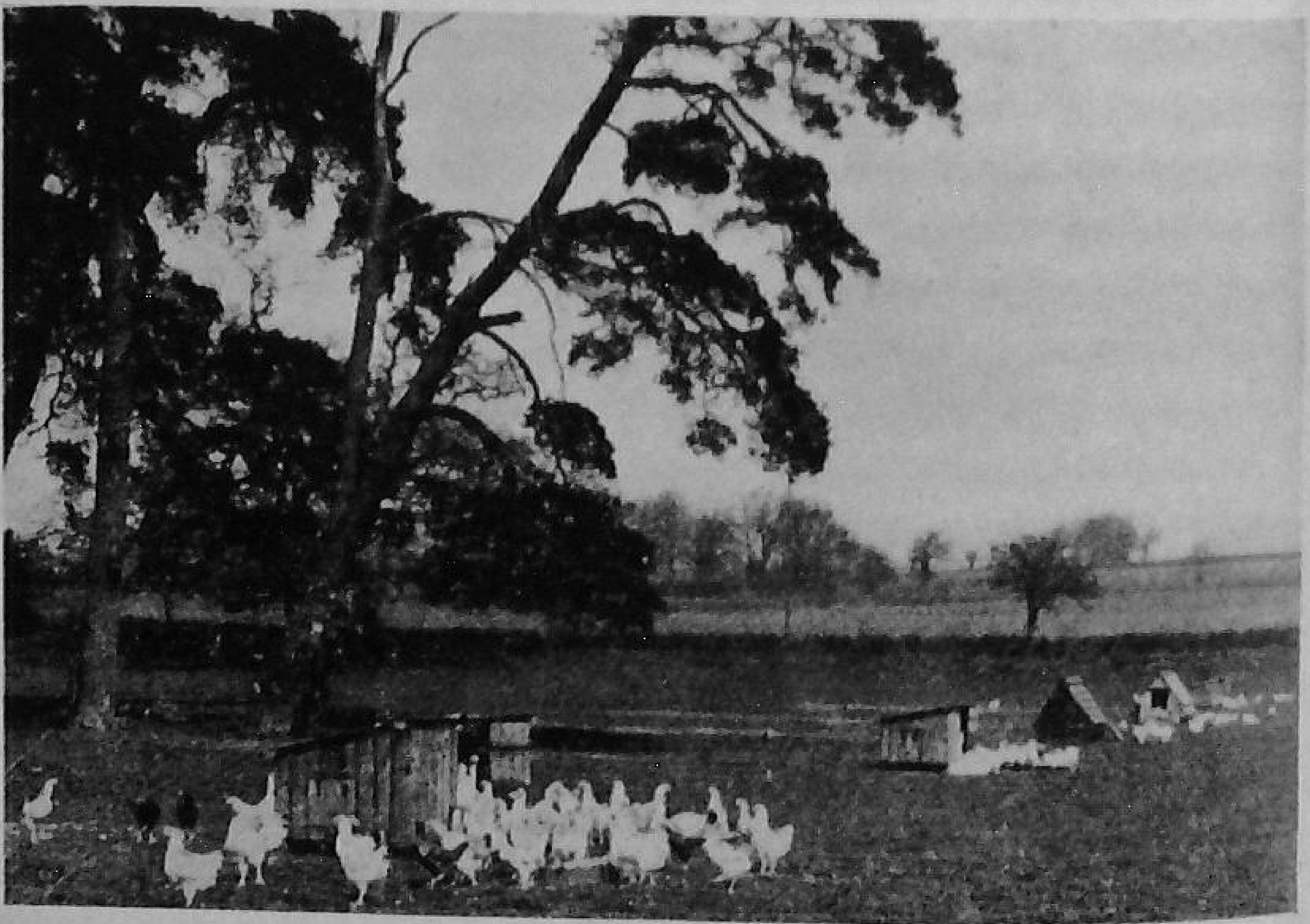


FIG. 42.—Sturdy breeding sires on a fresh, free range

important source of income, and again lists should be published giving complete details of breeding history.

Despatch is usually required from November, and one should try to plan to reserve just that number which will be sold readily. It is a common error to keep far too many, which cost much to feed, foul the ground and usurp houses wanted for other stock.

TRIOS

Two females and an unrelated male comprise a trio, and although demand is limited, prices are high. It is essential to give complete satisfaction, because trios are usually bought by expert discriminating poultry-keepers who want the best stock. The male should be a good match for the females to yield superb progeny.

BREEDING-PENS

These are a useful sideline, but not of a specialized nature, because inquiry is never brisk. The number of females should be either as ordered, or else the correct number to mate with the male, for example, if Light Sussex, then eight females and one male (unrelated).

All breeding-pens must be of tip-top quality. It will be highly injurious to the well-being of our industry if a collection of nondescript females with a surplus male is foisted on to a person who has not the experience necessary to appraise quality and who has ordered in the belief that he would be safe in your hands as a breeder.

QUALITY STOCK

It will be fatal to your goodwill, and highly detrimental to the poultry industry as a whole, if one single bird of any age or breed is at any time sold which in any degree fails in quality.

When demand exceeded the supply (as it did when I started in 1920), some folks could not resist selling in quantity, regardless of quality. It may happen again, and any considerate and enterprising poultry-keeper must avoid buying and must definitely resist selling poor-quality material.

If a buyer is given a bad deal, he will remember it for many years; he will not do business with you again; he will tell his friends. Your business will gradually fade, and a bad name cannot easily be erased.

If a buyer is dissatisfied with a transaction, and the fault is appreciated by you, then everything must be done, without delay or quibble, to rectify the mistake and to adjust the deal so that the buyer feels properly compensated. The buyer will thank you; he will appreciate your efforts; he will do further business with you; he will tell his friends.

If a buyer is extremely pleased with stock received, he may or may not tell you. If he does, the testimonial is valuable for publicity. More often you will not hear a word. What is more, he may not tell his friends.

Yet some buyers are difficult to please; some are even deceitful. I once sold a thousand chicks to an unknown customer, and in three weeks had a letter advising me that 721 were dead and if I did not replace he would put the matter into 'other hands'. Fortunately, I had a friend in that area, and he paid a visit, to find that mortality had been only 2 per cent! Needless to add, I heard nothing further.

BY-PRODUCTS

Any by-product which is of value to another section of the community should be sold.

Manure. One layer produces 80 lb. droppings a year,

all of which are collected in a battery, but approximately half on droppings-boards or in pits. Air-dried samples contain 4 per cent nitrogen, 3 per cent phosphoric acid, 1.7 per cent potash and 55 per cent organic matter. It is a safe fertilizer for all crops, and 8 cwt. have the same value as 1 cwt. of sulphate of ammonia.

Poultry-droppings *must* be stored in a rain-proof, open-fronted shed, because rain washes out valuable nitrogen. Alternatively, they may be used fresh on the soil, as mulch or, better still, mixed with material on the compost heap.

I use all the droppings on my land, with excellent results; but where one has a surplus, it should be offered to local market-gardeners or nurserymen.

It is often possible to make a level exchange of straw or chaff (for poultry litter) in exchange for the manure produced. To make the droppings better to handle, and to prevent the valuable nitrogen from leaching, 10 per cent super-phosphate should be mixed in. The boards should also be sprinkled.

Feathers. Before the War the sale of feathers paid for the cost of plucking, and to-day they are most valuable. They may be used for home cushions and pillows merely by drying them slowly in open-mesh sacking bags, or sold to specialized feather merchants. The different grades *must* be kept quite separate at plucking time, or the bulk lot will make the price ruling for the cheap grades. They should be saved in separate sacks, and offered for sale when there is at least a stone of each grade.

If one has considerable plucking of different birds, it will pay to keep coloured and white body-feathers separate.

Some firms purchase the short hackle-feathers from the back of the neck, which are exported for making fishing-flies, and an inquiry may prove of value.

Poultry-keepers often experience a difficulty in finding feather merchants. Here is a selection:

Horace Friend, Ltd., Wisbech, Cambs.

Glaser and Harris, North Street, Luton, Beds.

Spitz Bros. Eagle Yard, High Road, Tottenham, London, N.17.

S. Sussman, 6 Bethia Road, Bournemouth, Hants.

P. and G. Neary, 145 Hill Street, Liverpool 8.

Grading for maximum prices is as follows: white goose, coloured goose; white duck, coloured duck; white turkey body, mixed coloured turkey; white poultry body, mixed poultry; duck, goose, turkey and fowl quills. Some merchants pay especially well for cockerel's long tail-quills, cockerel hackles, coloured and white.

As there is a considerable variation in the prices offered, it would be well to make full inquiries. *Get a definite price in writing.*

PRESERVING EGGS

Preservation is of value in that: (1) it tends to buffer the glut of April to May eggs and to bolster scarcity in November and December; and (2) it enables cheap summer new-laid eggs to be preserved and sold at the higher winter prices.

Success depends on selecting eggs which are clean (preferably unwashed), under ten days old, infertile (that is, from unmated hens), strong and smooth of shell and stored in a cool, dry place.

Duck-eggs preserve as well as hen's eggs.

Suitable receptacles are galvanized buckets, glass tanks, earthenware jars or enamel pans, but the best vessel is the special pail with removable wire basket and lid.

Waterglass (sodium silicate) is the popular preservative.

One pint is dissolved in 9 parts boiled and cooled water; and this quantity will preserve 100 eggs. A one-gallon pail will hold forty eggs, and three and a half pints of mixed solution will be needed to cover them.

The eggs are packed large end upwards to within 3 in. of the top of the vessel, and the mixed solution poured in to cover the top-most egg by two inches. If there is no lid, a double thickness of cloth should be tied over the top, and the vessel then stored in a cool, dry, airy room.

Other satisfactory methods are to dip the eggs in a shell-sealing oil or to rub the shells with a special grease.

CHAPTER XIII

PUBLICITY, ADVERTISING, RECORDS AND STAFF

A SUCCESSFUL poultry farmer needs to be a capable salesman and business man as well as a producer. He must produce the quality article at the most appropriate time; he must sell that article in the most attractive manner; he must reach the most suitable buyer at an economical cost.

THE FARM

Let us be done with the farm which is untidy and ill-planned; the houses which are in disrepair and out of date; the approach which is undignified.

Many prospective buyers pay a visit to the farm, and surely they must lose confidence (perhaps unfairly) if they see slovenly management. Lack of care and attention to the farm itself may well give the impression of inaccuracy in pedigree or age, loss of confidence in records and details.

Attractive features worthy of consideration are:

1. A large, well-painted board giving the name and the owner of the farm.
2. Direction-signs in the village to help the stranger.
3. A pleasant entrance drive with shrubs and herbaceous plants.
4. A clean, dry, metalled drive during all weathers.
5. Dry paths and run gateways made up with any cheap rubble.
6. Maintenance of an excellent state of repair by

creosoting, tarring and painting (and this goes for the dwelling house, too).

7. Order in all things (for example, straight netting-fences, upright posts).

8. Absolute cleanliness (for example, clean droppings-boards, swept food-store floors, bright windows).

9. Efficient, smart workers giving a good impression of skilled organization.

BUSINESS APPROACH

Greet the customer with a friendly smile and handshake. Assist him in choosing the most suitable poultry. Be patient and tactful, even with those who have obviously come to spend an afternoon to pick your brains.

From your point of view, you must clinch the deal. Some buyers take a good deal of persuading. It is your job to marshal your facts concisely and to prove, in a logical, entertaining manner, why the sale should be concluded.

The buyer is usually interested in the present. You should have an eye on the future, and may well recommend the purchase of certain stock at a later date, and thus obtain a forward booking. This helps greatly in your plans for hatching and rearing.

THE OFFICE

Maintain a smart, neat, pleasant office, where your customer may sit in the warm and dry. He might choose a foul day of snow or rain to visit you, and he will appreciate the chance of discussing pedigrees, records and prices in comfort. He can be shown your record and sales books, your laying test certificates, your show-card wins and perhaps even your silver cups and trophies.

A sale is far more likely, and at a good figure, if you can impress your customer with your ability, provided you keep conceit out of it.

PUBLICITY SCHEMES

Careful advertising (backed by sound business principles) will lead to sales and success, and build up a business far greater than that of most competitors. The average poultry farmer has little skill (and, worse still, less desire) to advertise. Advertising is vital, but it must be economical, carefully planned and proved satisfactory.

Most poultry farms are situated off the beaten track, and a customer is encouraged to take an interest in your stock only when he is told about it by means of the printed word.

Schemes which have proved their worth are:

1. A well-designed letterhead printed in modern type on good paper, stating (*a*) breeds kept, and (*b*) notable wins at tests and shows, and picturing any cups or medals awarded.
2. An attractive catalogue, easy to understand, logical in arrangement and with the facts well marshalled.

   N.B.—Give the prices clearly; it is fatal to ask customers to write for quotations or particulars. Use pictures of the farm, lay-out and stock.
3. Envelopes printed 'if undelivered return to ——' (your address), so that your name-and-address records can be kept up to date, and to avoid waste of costly literature.
4. Follow-up leaflets to keep your name before your customers.
5. Special offers sent only to those likely to make use of them.

But for all printed matter, do not order excessive quantities, even if your printer tells you how cheap it is to buy in quantity. Suggested quantities at the start would be 500 letterheads (quarto size—that is, 10 in. × 8 in.), 500 envelopes and as many catalogues and lists as you have

customers on your books, plus an extra quantity made necessary to cover inquiries from press advertising. For writing letters, have the letterheads bound in book form a hundred in each book, with a hundred duplicate plain sheets for carbon copies. Better to type and to file the carbons.

Have a distinctive colour scheme—say green and cream, or black and gold, or brown and yellow—and use the two colours on all printed matter: signboard, delivery van and so on.

PRESS ADVERTISING

Use that paper which reaches the buyer most interested in the article you have to sell at a given time. Press advertising is costly, and a sum should be set aside each financial year for it.

When the farm is established, it is better to advertise regularly than occasionally. A position facing reading-matter is far superior to one lost in a maze of 'smalls' and 'displays'.

Try to discover which paper is bringing in the best results. This can be done by putting a number in front of the poultry-farm name—thus, Tom Brown, 3, Highlands Poultry Farm. Crayford. A different number is used in each paper, and it is hoped the inquirer will put that number on his envelope, which you then keep for record purposes.

For a 'display' advertisement (priced at so much an inch), it is better not to crowd, but to try to catch the eye of the reader with blank space, or with heavy rules, or a sketch.

A 'classified advertisement' (priced at so much a word) is included along with other advertisements offering a similar product.

Advertising in the local weekly, though cheaper, is rarely as useful as that in a poultry or farming journal. Beware of special offers at low rates. The criterion of an advertisement

is its pulling power and the value of the business done per £1 of advertisement cost.

The National poultry and farming weeklies are:

The Smallholder, Southampton Street, London, W.C.2.

The Farmers' Weekly, 43–44, Shoe Lane, London, E.C.4.

The Farmer and Stockbreeder, Dorset House, Stamford St., London, S.E.1.

Poultry, 30, Commercial Road, Bournemouth.

Poultry Farmer, 189, High Holborn, London, W.C.2.

Poultry World, Dorset House, Stamford Street, London, S.E.1.

Modern Poultry Keeping, 2, Breams Buildings, London, E.C.4.

Other journals are:

Poultry Industry, Milford, Godalming, Surrey (every 4 weeks).

Poultry Field, 37 Guildhall Street, Preston, Lancs. (every 2 weeks).

KEEPING OF RECORDS

Records and accounts are an unmitigated nuisance. After a hard day's work slogging on the farm, one is too tired to settle down to figures. However, records are absolutely essential. They are necessary for reference, for comparison and for detailed study with a view to improvement. They enable mistakes to be remedied before serious losses have occurred. Simplicity and speed of reference will make the work less tedious.

Here are suggested records, with the data they should give. All may not be necessary, and those should be chosen which apply to your particular activities.

Egg Register.

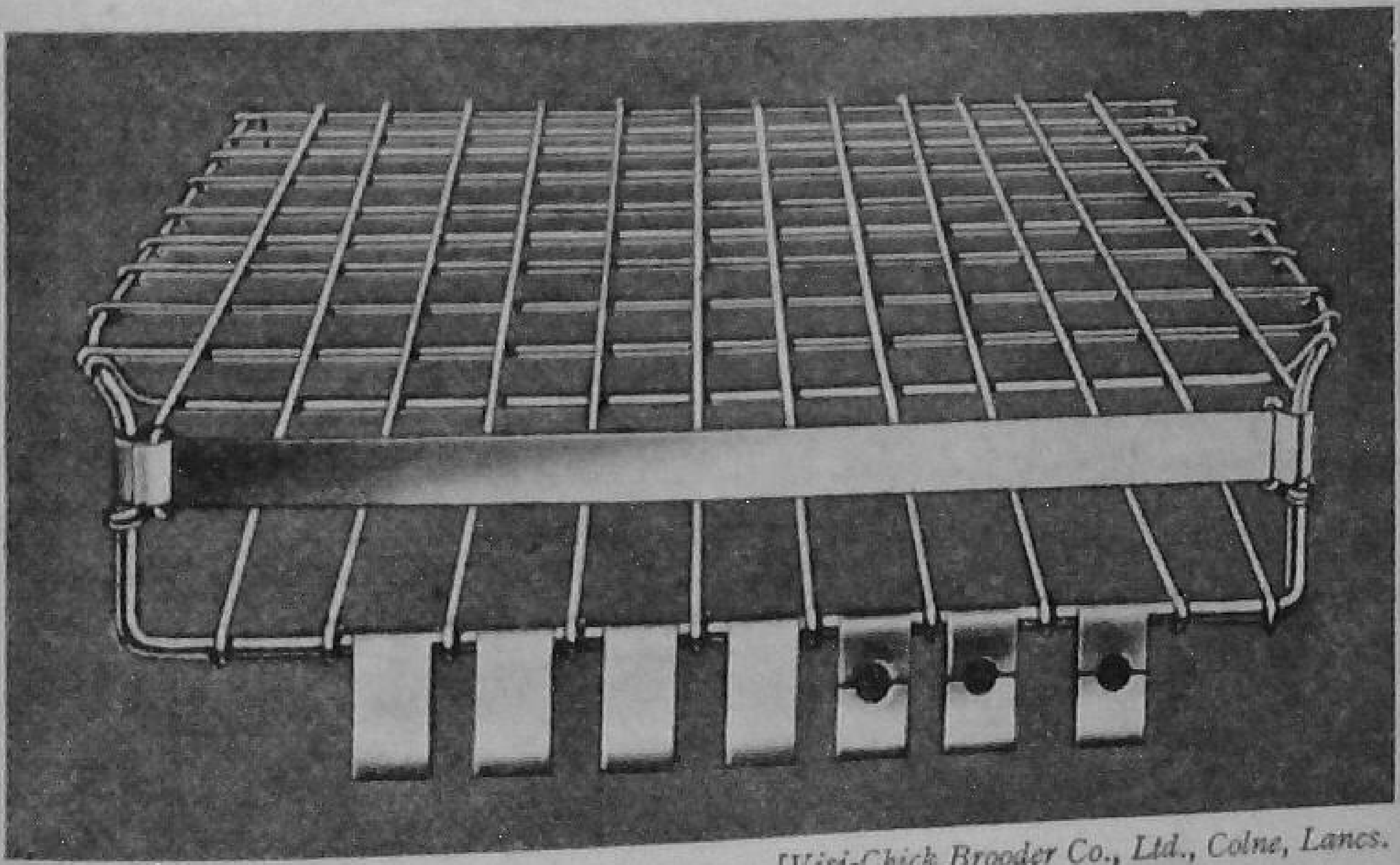
(*a*) Egg-collections daily per house, and alongside each number should be entered the quantity of birds. If there is a change in fowl population, the reason should be stated, so that mortality and other losses may be recorded, and so that the percentage pen egg-production may be accurately computed (Fig. 43).

(*b*) Monthly and also yearly egg records per house, and grand totals daily, monthly and yearly of all eggs collected.

N.B.—Egg records per bird in laying-batteries are recorded on a card attached to each pen.

Trap-Nest Records.

Record-cards kept in the trap-nesting house usually show the number of eggs laid each day by each bird individually, identified by numbered or coloured leg-bands (Fig. 44). I submit that the cards should also provide a comprehensive history of each bird. Thus the card is marked in a certain



[*Visi-Chick Brooder Co., Ltd., Colne, Lancs.*

FIG. 43.—A simple and efficient egg-recording device for laying cages. The metal tabs are reversed to indicate eggs laid

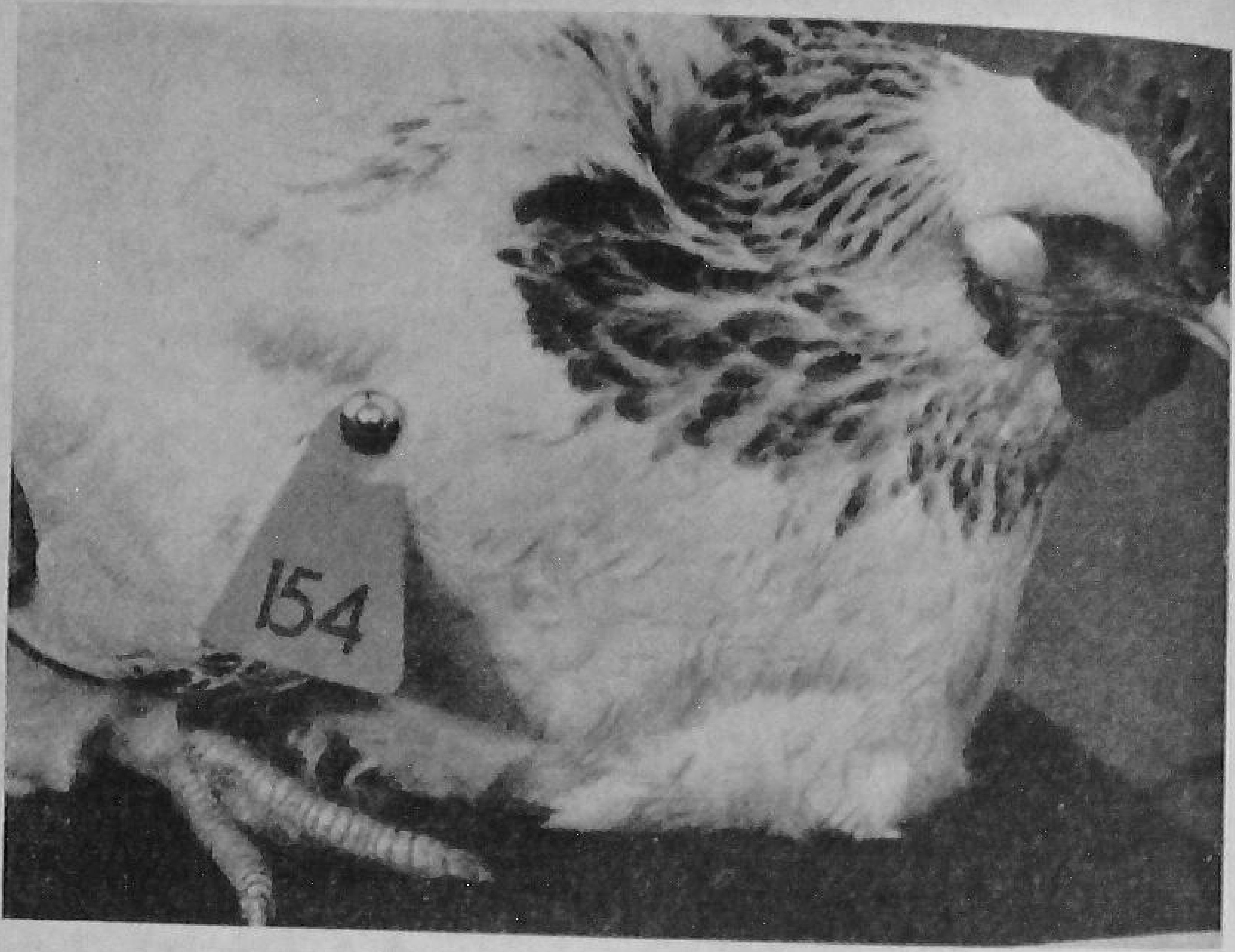


FIG. 44.—A recording tab

way if a bird is ill or broody, or moulting, or removed for showing. Size and quality of egg are also recorded. At the end of the year quick reference will give a complete picture of the value of each bird.

Incubation Chart.

This is designed to show:

Incubator number; breed; pen; time set; date set; number of eggs set; infertiles; broken yolks; addled; dead in shell; chicks hatched.

It is also useful to record twice each day, morning and afternoon, the temperature of the incubator and of the incubator-room. At the end of the season, one can compile: total eggs incubated; total infertiles, etc.; total dead in shell and addled; total chicks hatched; percentage of fertility; percentage hatchability.

a1

Pedigree Record.

To reach the top of the tree as a pedigree breeder, one should record every detail in the life of a given fowl. It is not enough to rely upon egg records alone. Having every factor available for study, one can so select and mate that a superb line of poultry is produced which, when their outstanding virtues are proved to the industry, will return handsome dividends.

A complete record of a bird would show (in this order): annual egg record; egg-weight and quality; weight of bird (taken when seven and nineteen months old); periods of broodiness; health; date of moulting; colour and type; show wins; laying-test wins (if entered); number of eggs incubated; full history of incubated eggs; number of chicks hatched; quality of chicks; growth of chicks; date of laying first egg and so on from the annual egg record round again.

N.B.—When used for a breeding fowl, the record should give the value of its progeny, for by so doing outstanding strains can be built up.

Show Record.

This can be quite simple, and records name of show; date; breed or variety; leg-band; judge; awards; expenses; value of prizes; specials awarded. Many show records I have seen omit the most important feature—that is, the individuality of the bird, which I have termed 'leg-band'. As to expenses and receipts, it is rare that exhibiting shows a profit. Showing is valuable in that it tends to raise the average price which you can charge for stock.

It is preferable to use thin cards for records, not paper, which wears badly. The cards can be ruled with the headings suggested above, and when one has devised a comprehensive and satisfactory lay-out, then the cards can be printed.

Records by themselves are of little value. They should be studied so that adjustments can be made, matings planned and improvements effected. They should be kept properly filed, for reference to records many years old may prove of inestimable worth.

I like the idea of keeping graphs. Squared graph sheets can be purchased to fit in a loose-leaf cover, and on each sheet many years' records can be kept, which will provide a quick reference of past activities.

SIMPLE ACCOUNTS

Accounts are vital in that they give at any time a picture of the financial position. At the end of the year they should be audited by accountants and an 'income and expenditure' account and a 'balance sheet' drawn up.

But they should be kept simple.

A stock 'Account Book for Poultry Farmers' should certainly be purchased. It is simple and explains itself. Most poultry papers publish such a book.

If one has time to study 'A Simple System of Book-keeping', then Bulletin No. 58 of the Ministry of Agriculture is useful.

For *sales* and *purchases*, an ordinary analysis book with many ruled cash columns, is to be recommended. On the sales page there would be columns for: date; item; commercial eggs; table-poultry; hatching-eggs; day-old chicks; pullets; cockerels; manure; feathers; sundries (for example, prize money).

On the *purchases* page would be: date; item; food; wages; hatching-eggs; day-old chicks; stock; stationery; advertising; repairs; stamps; carriage; sundries (for example, rent, rates and entry fees).

Houses and appliances which are a capital outlay should be recorded in a separate account.

From the above figures a 'profit and loss account' may be drawn up in a simple manner as follows:

NET PROFIT AND LOSS ACCOUNT

Payments	£ s. d.	*Receipts*	£ s. d.
To valuation at beginning of year:		By Receipts (Sales):	
Stock . .		Commercial eggs	
Buildings . .		Table-poultry .	
Appliances, etc. .		Hatching-eggs .	
Food and litter .		Day-old chicks .	
Purchases and expenses:		Pullets . .	
Foods . .		Cockerels . .	
Hatching-eggs .		Manure . .	
Day-old chicks .		Feathers . .	
Stock . .		Sundries . .	
Stationery .		Value of eggs and poultry consumed in the house . .	
Advertising .		Valuation at end of year:	
Repairs . .		Stock . .	
Stamps . .		Buildings . .	
Carriages . .		Appliances .	
Wages (incl. the owner's) .		Food and litter .	
Rent and rates .		Sundry debtors at close of year .	
Sundries . .			
Sundry creditors at close of year .			
	£		£

If the balance is on the left-hand side, it indicates a profit to that amount; if on the right-hand side, a loss.

Valuations are made at cost price or market value (that is, forced sale), whichever is the lower. I strongly recommend having your accounts audited each year by a qualified accountant, who will also be most willing to show you how to keep simple accounts.

STAFF

Every person working on the farm must be efficient, painstaking, willing, pleasant, methodical, tidy and conscientious—or at least so far as possible. To-day wages are

a heavy item on the expense side, and it is necessary to maintain a good staff.

Net profit is reduced:

(*a*) If one worker is unsatisfactory.
(*b*) If operations are not skilfully planned.
(*c*) If discipline is poor.
(*d*) If the equipment is out of date.
(*e*) If the farm is badly planned thereby making unnecessary work.
(*f*) If the farm is not efficiently mechanized.

Encourage the staff to take an interest in their allotted tasks. I suggest women for the light jobs, such as incubating, rearing, trap-nesting and possibly feeding; men for the heavy operations of cleaning out, repairs, moving of appliances and erecting of runs.

If you have the right staff, they appreciate a small commission on eggs hatched, chicks reared, commercial eggs laid. But the ignorant, envious, lazy worker cannot be improved by incentives. He must go, and be replaced by a sound assistant.

The right staff can be led. You, as a leader, will get the best out of the staff. A man who is a driver does not deserve (and will not retain) co-operation.

The wages paid will be based on the Agriculture Wage Rates, a copy of which can be obtained from the local branch of the National Farmers' Union. Any member of the staff who is skilled or particularly valuable may well be paid rather more than the standard rates. A worker who is poor cannot be paid less, and so, in your own interests, he must go.

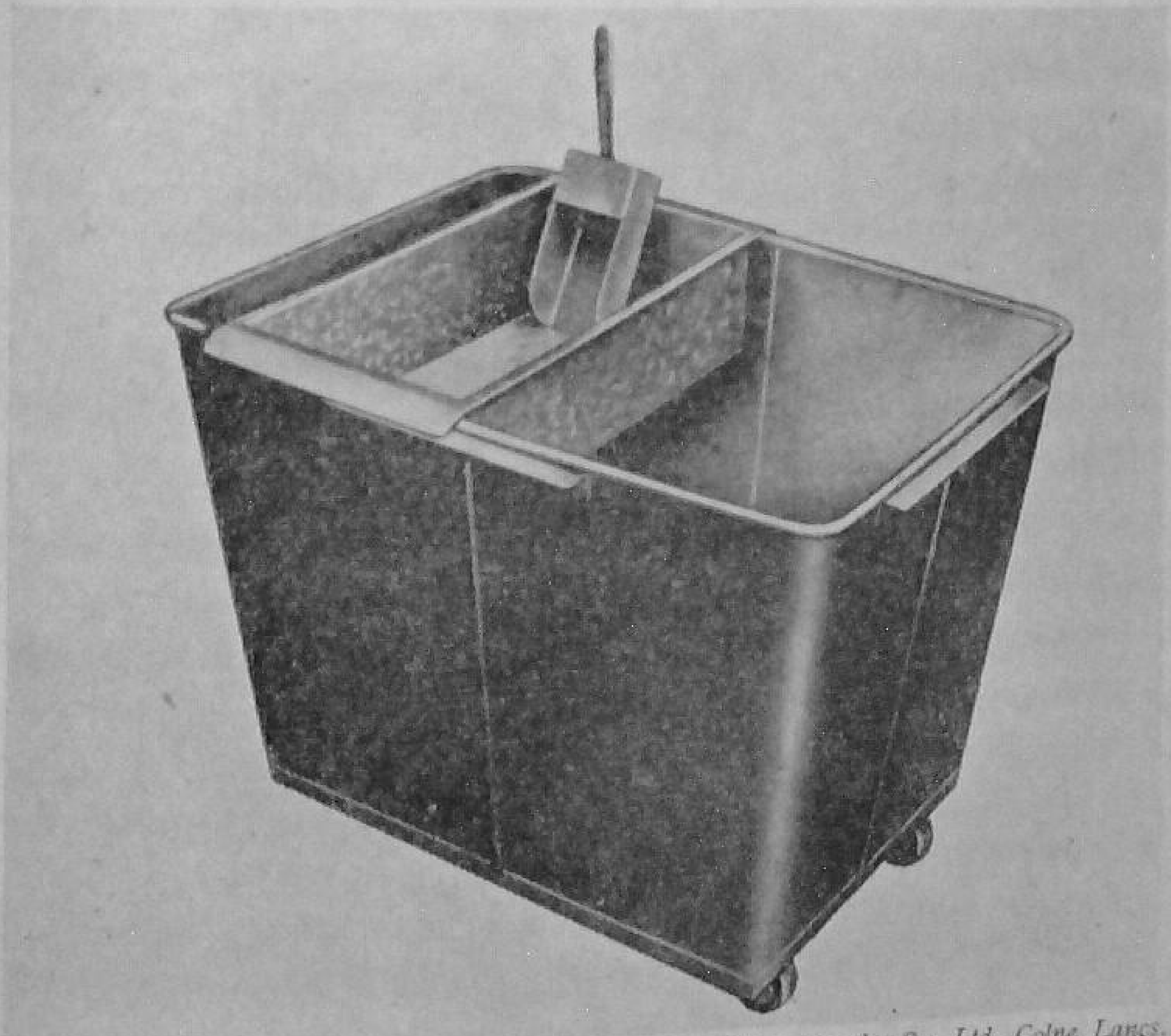
When the farm is in good running order, pupils may be taken. Before the War, these either paid a premium to be taught, or gave their services for their keep, or were paid a

small wage. But do not regard them as a cheap form of labour to be exploited. Properly guided, they can be most useful.

It is often possible to find excellent young girls who have a flair for livestock, and who are most useful at fourteen years and upwards; but most young boys can be nuisances unless they are working with an adult. Never set two boys to see a job through by themselves.

MECHANIZATION

It is cheaper to use a machine to do a job than manual labour. I would advise the purchase and use of all mechanical devices possible (Fig. 45).



[*Visi-Chick Brooder Co., Ltd., Colne, Lancs.*

FIG. 45.—A modern food-truck to save labour in battery sheds

Here is a selection:

- Motor scythe for cutting grass in runs at least four times a year.
- Electric clippers for rapid trimming of hedges and hanks.
- Motor mower for lawn-mowing the entrance drive.
- Paraffin engine for pumping water laid on to houses and for electric lighting and power.
- Light tractor fitted to do a combination of jobs such as cultivating, sowing, spraying and hauling.
- Modern water boiler for warm mashes and drinking-water in frosty weather.
- Power-driven wet- and dry-mash mixers.
- Steam boilers for cooking potatoes and roots.
- Power chopper for cutting roots and green-food.
- Sidecar or motor-car (old) fitted with truck body to fetch and carry (no licence required if kept on the farm).
- Self-turning egg-trays in small incubators.
- Automatic electric heating humidifying and egg turning for incubators and brooders.
- Power-driven chaff cutter for producing admirable brooder litter.
- Power-driven hammer mill for grinding home-grown grain.
- Automatic time-switches for night lighting layers.
- Self-filling water-pans from mains or supply tank.

CHAPTER XIV

DISEASE

No other livestock enterprise could thrive if it suffered the mortality of poultry. During 1936–37, in the recognized laying trials, the percentage mortality was nearly 18 per cent. On many farms it exceeded 20 per cent. During 1945–46, out of 2,456 laying trial entries, the mortality was 11 per cent. In the 1952 National Test, with 3,270 birds, it was nearly 10 per cent. Let us keep it below this figure.

This high mortality over the years has not crippled the poultry industry, probably because the fowl is a relatively small animal and can be replaced at a low cost. Fowl mortality, however low, means a direct reduction of net profit. In other words, the less mortality, the higher the profits.

Perhaps the poultry farmer is gradually forced to adopt an indifferent attitude to the matter of mortality. The beginner regards the demise of one fowl as a tragedy. Pity it is that this outlook is not retained. One must strive to keep the mortality low. It can be done, for I know farms which have never suffered more than a 5 per cent annual loss. I think that much of the trouble is due to an incorrect approach to the problem.

DISEASE RESISTANCE

Let this be well understood: there are germs, parasites, fungi and viruses in the air, buildings and soil and carried by other poultry and animals, merely waiting their opportunity to attack. When we (I prefer to blame ourselves) so mis-

manage that resistance to disease is lowered, then our poultry fall sick.

I am convinced that the best way to prevent disease is to breed, house, feed and manage in such a manner that the disease 'bugs' (most of them) just cannot make their presence felt.

What the novice expects, and usually gets, in a chapter on diseases is a list of the ailments and the guaranteed cures. Let this be realized right away: *that most poultry diseases are difficult to cure, and the treatment is often long, tedious and expensive.* The pills and potions offered are effective only in the case of the simple troubles (due to gross mismanagement) and some of them are of doubtful value.

The common practice of adding drugs, etc. to the drinking-water is to be deprecated. You should pin your faith on your own ability to keep your stock healthy rather than upon 'magic' cures.

Disease can be successfully combated by:

1. Selecting the breeders for stamina and health *first*, and heavy egg production second.
2. Breeding from birds which have no inheritable diseases (such as bacillary white diarrhœa).
3. Breeding from birds which have no predisposition to disease (such as fowl paralysis).
4. Keeping the defensive system of the fowls' bodies in a high condition of perfection.
5. Feeding a complete ration in an approved manner.
6. Housing efficiently, particularly with regard to overcrowding.
7. Providing clean, well-drained ground at all times (grass, where provided, *must* be kept short).
8. Paying strict attention to sanitation and cleanliness.
9. Using disinfectants where necessary (I consider the best disinfectant is of the non-caustic chlorine type).

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10. Immunization by vaccination.
11. Exterminating rats and mice.
12. Destroying external parasites (fleas, lice and mites) and internal parasites (worms).

So there is not one secret operation to prevent disease. It is a matter of preserving good health from day to day and every day.

IF AN OUTBREAK OCCURS

In the nature of things, one will have to take steps, at one time or other, to overcome an outbreak of disease. A general knowledge of diseases is built up with experience, but one might well read up the subject and keep one or two books handy for reference.

Suitable books are 'Some Diseases of Poultry' (Bulletin No. 6 of the Ministry of Agriculture); 'Diseases of Poultry', by W. P. Blount (Baillière), and 'Diseases of Poultry', by Ernest Gray (Crosby Lockwood and Son, Ltd.).

An excellent American book for students is 'Diseases and Parasites of Poultry', by Barger and Card (Henry Kempton).

If you desire a book on biology, then it is 'Biology of the Fowl', by Ernest Evans (John Dixon, Ltd.). An advanced book on Anatomy is 'Anatomy of the Domestic Fowl', by B. F. Kaupp (W. B. Saunders Company).

An Outbreak of Disease. It is important to observe the behaviour of the fowls every day. For general observation, feeding time is appropriate; for individual examination either at night on the perches (with a good light) or in the daytime in culling-crates, the birds being shut in over-night.

Immediately a fowl is seen to be behaving in an abnormal manner, or is obviously sick, it must be caught up (the best catcher is a fish landing-net on a 6-ft. handle), examined, and removed to an isolation coop or pen until one has discovered that the ailment is not infectious or contagious.

A disease can be checked only if it is observed on the day it first breaks out and immediate steps are taken: (*a*) to prevent its spread; (*b*) to remove the predisposing causes;

CAUSES OF DEATH AT THE YORKSHIRE FEDERATION LAYING TEST, 1952

CAUSE OF DEATH	*No. of deaths*
1. Disease of the reproductive system (including egg peritonitis, impacted oviduct, etc.)	44
2. Disease of the urinary system (including visceral gout and nephritis)	8
3. Disease of the digestive system (including degeneration and rupture of the liver, impactions of the crop, gizzard or intestinal tract; chronic bowel abscesses)	12
4. Disease of the circulatory system (including round heart disease, heart failure, etc.)	3
5. Fowl paralysis complexes, including:	
(1) Visceral lymphomatosis (tumour formation and infiltration of lymphomatous type in internal organs)	19
(2) Neural lymphomatosis (nerve enlargements only)	5
(3) Leukaemia (disease of blood, and blood forming organs)	2
6. Tumour formation (other than lymphomatosis)	7
7. Aspergillosis	3
8. Miscellaneous:	
(1) Joint infection	1
(2) Asphyxia	1
(3) Heat stroke	1
(4) Severe vent gleet	1
(5) Cannibalism	1
(6) Injury	2
(7) Red mite	1
9. Undiagnosed or decomposed	9
Total	120

Mortality 10·40 per cent.

(*c*) to effect a quick cheap cure OR to kill the bird and burn the carcase.

The cause and treatment must be ascertained quickly. If it is a simple trouble, it may be possible to diagnose it

oneself; but if there is the slightest doubt, then one should call in the County Poultry Advisory Officer by telephone.

The utmost speed is essential in order that the correct remedial measures shall be taken.

Do not hesitate to kill any fowl which is not likely to respond quickly to cheap treatment. Above all, do not keep it on in a 'hospital' in the hope that it will survive.

Post-mortem. After-death examinations are a favourite topic of lecturers some of whom are quite incompetent to discuss the subject. It is perhaps interesting to open a fowl (this is explained in several books) but organ abnormalities are not easy to appreciate, and confusion may result.

Better to let the County Advisor give his opinion. If you want a bacteriological and microscopical examination, then send, carefully packed, to the Ministry of Agriculture Laboratories, New Haw, Weybridge, Surrey.

THE COMMONER DISEASES

For speedy reference, concise information is given below, the diseases being in alphabetical order. If the sick fowl does not appear to exhibit symptoms of any of the diseases described, then contact the County Poultry Advisory Officer without delay. The introduction of new drugs detailed below has done much to revolutionize disease control. Your chemist can supply.

BLACKHEAD

Symptoms. Occurs in turkeys of all ages. The head is rarely black. The young birds show weakness, wing-drooping, loss of appetite and yellowish-green droppings. The liver is enlarged, and shows yellowish-green areas from $\frac{1}{8}$ to $\frac{3}{4}$ in. across, and the cæca are cheesy and enlarged.

Cause. A minute parasite picked up from the soil. Fowls act as carriers and should not run with turkeys.

Treatment. None when disease is well established.

Prevention. Where exposure is likely, or one bird is suspect, start preventive measures. One such drug is Turkesan, one tablet to each 2½ gallons drinking-water, making sure that no unmedicated water can be reached. Where wet mash is fed, the water used for mixing should be medicated as above. Where the disease may have got some hold, it may be necessary to give Orarsan-Veterinary by mouth or Stabilarsan-Veterinary, Neo-Salvarsan or Vetarse-nobillon by injection.

From the United States comes the drug 2-amino-5-nitro-thiazole, now manufactured in Britain, and sold as Entramin premix for mixing in the mash at the rate of 2 oz. to 28 lb. mash for fourteen days for treatment, and half that for prevention.

The ground upon which an outbreak has occurred should not be used for turkeys for two years.

The blackhead parasite may be carried into the blood-stream by the cæcal worm and an excellent means of prevention is to dose weekly with 2 lb. of phenothiazine powder (such as Phenosan) in each 1 cwt. (112 lb.) of mash, but not to turkeys under a month old, nor if being treated with a drug. For individual weekly treatment an alternative is one 7½-grain phenothiazine pill per turkey eight to ten weeks old, two pills ten to twelve weeks, three pills twelve to sixteen weeks and four pills sixteen weeks and older. The birds should be moved to fresh ground, to avoid re-infection.

BUMBLEFOOT

Symptoms. A painful abscess under the foot, causing lameness.

Cause. Usually an injury from a stone or thorns, but may be of a gouty nature.

Treatment. Soften by poulticing with hot kaolin clay on cotton wool held in place with plaster. Later lancing and expressing of core may be necessary.

Prevention. Keep run free from stones, etc.; floor littered; do not feed more than 12½ per cent fish or meat-meal in the mash.

B.W.D. (Bacillary White Diarrhœa)

Symptoms. In chicks (occurs when three to seven days old) weakness, wing-drooping, cheeping and usually a white or yellow diarrhœa. Spreads rapidly and causes high mortality.

Cause. A germ, *Salmonella pullorum*, which has been passed to the chicks from the parents or from infected chicks.

Treatment. None.

Prevention. Only those birds should be used for breeding which have been blood tested and found non-reacting, and therefore do not contain the germ.

COCCIDIOSIS (cæcal acute form in young stock)

Symptoms. Usually occurs between ages of two and twelve weeks. Dullness, ruffling of plumage, staggering, moping and diarrhœa (mostly containing blood). A serious and common disease of growing stock affecting the blind guts (cæcal tubes).

Cause. A parasite, *Eimeria tenella*, picked up from the soil and droppings.

Treatment. Several of the modern drugs are of proved value, such as Sulphamezathine sold as such, or sulphaquinoxaline sold as Embazin, or nitrofurazone sold as Ibiofural, or sulphathiosole as Avisol. They can be

obtained from your chemist, along with detailed leaflets which describe their use either added to the drinking-water or to the mash.

Prevention. Until the above treatment can be started, one may check the spread by keeping the birds away from the droppings. On solid floors a sprinkling of really dry sawdust is the best litter, and this, with the droppings, is cleared up each day; on slatted floors the ark should be stood upon sacks, so that the droppings do not reach the soil and can be collected up. Damp areas should be avoided.

Disinfectants are of no use. For spraying, swabbing and scrubbing to prevent the 'bugs' developing, a 10 per cent solution of *household* ammonia in water is excellent, but it must be liberally used, and left to dry in.

COCCIDIOSIS (duodenal chronic form in adult fowls)

Symptoms. Loss of flesh, weakness of legs and wings, usually good appetite and high thirst, loose brown-and-yellowish droppings.

Cause. Infestation with coccidial parasites, *Eimeria acervulina.*

Treatment. A fowl which is seriously ill should be killed and the carcase burnt. The remainder should be treated with the drugs as recommended for the cæcal coccidiosis above.

Prevention. Clean, fresh ground; freedom from overcrowding; good sanitation.

CONTAGIOUS CATARRH (Roup or Coryza) (Fig. 46)

Symptoms. Sneezing, swelling around eye, discharge from nostrils, loss of flesh.

Cause. A micro-organism. The predisposing cause is bad ventilation around the birds on perch at night, or bad

management, *not* cold weather. Wrong feeding, with lack of vitamin-A produces some of the symptoms.

Treatment. Neither easy nor rapid. Success follows a combined routine, namely: (*a*) give flock or individual treatment with sulphathiazole such as Avisol; (*b*) each day swab face and eyes and mouth with warm disinfectant (I prefer the hypochlorite type) or, better still, wash out head-passages with a nasal syringe; (*c*) keep drinking-water sterile with similar disinfectant; (*d*) cease feeding dry mash, but give wet mash and grain; (*e*) spray over heads of birds on perch each night with disinfectant solution; (*f*) add 1 per cent cod-liver oil to the mash if not included; (*g*) improve housing conditions.

FIG. 46.—Contagious catarrh

Prevention. Feed well, provide draught-free night ventilation and manage efficiently.

CONGESTION OF LUNGS (in chicks)

Heavy chick-losses occur under the brooder through over-heating, under-heating, chilling, sweating, overcrowding and lack of fresh air. Pneumonia often intervenes. There is no cure, and chicks which recover are often worthless. It may be completely avoided by sound management, and hygienic rearing.

CROP BINDING

Symptoms. Enlargement of crop, with stoppage of food.

Cause. (*a*) Usually attributed to the eating of long, tough

grass or feathers; (*b*) in old birds it may be caused by weakening of crop-muscles (no cure); or (*c*) blocking of intestinal tract by attack of coccidiosis, or worms or fowl paralysis (which refer to).

Treatment. If due to mechanical stoppage, make incision 1 in. long in crop, skin and then at side through flesh, remove contents with small spoon and stitch up with surgical silk or nylon. Get an expert to operate before you try it out.

Prevention. Maintenance of short grass in runs; efficient and ample feeding; cleanliness in intestines.

FLEAS

Symptoms. Fowls preening feathers and irritable on nest. Minute blood-spots on egg-shells.

Cause. Body parasites (fleas) which live in filth and dust, usually in nest.

Treatment. Paint two square inches in centre of nest floor with 40 per cent nicotine sulphate solution *or* dust (not too liberally) with 5 per cent DDT powder.

Prevention. Strict cleanliness.

FOWL PARALYSIS (avian leucosis), including Lymphomatosis (Fig. 47).

Symptoms. Varying in different birds Lameness; jerky walk; clutching of claw; wing-drooping; neck-twisting; crop-binding; blindness and tumour formation.

(*N.B.*—Weakness of legs and wings, loss of flesh and general debility are common symptoms also of coccidiosis and worms, and before a cure can be effective, the true disease must be identified by a post-mortem examination.)

Cause. Ultramicroscopic virus transmissible through the egg, by infection or by contamination of the ground. Hens can act as carriers.

Treatment. None.

FIG. 47.—A victim of fowl paralysis

Prevention. Breeding from birds who themselves and whose parents, sisters or brothers have shown no signs of the disease; culling ailing fowls; making sure, when purchasing stock of any age, that they come from a strain which has at no time shown indications of the disease; keep strains of hatching-eggs separate in small incubators and rear separately; disinfect all appliances between chick hatches. Practise the 'closed-flock' system of breeding.

FOWL POX

Symptoms. All those given under 'Contagious Catarrh' (Roup) *plus* raised warty yellow nodules (turning black) on the comb, wattles or face and/or yellow lesions in the throat.

Cause. A virus.

Treatment. Adopt remedial measures as suggested under 'Contagious Catarrh'. Paint growths with strong tincture of iodine.

Prevention. Vaccinate with fowl-pox vaccine *all* the birds on the farm as soon as one bird shows the symptoms.

Vaccinate again in the early autumn of the following year. Vaccination gives an immunity for one year at least as does an attack from which birds recover.

GAPES

Symptoms. Usually in chickens or turkeys, one to five weeks old. Coughing, sneezing, stretching of neck and yawning (gaping). If treatment is delayed, birds will become unthrifty and die from suffocation.

Cause. Small, fork-shaped worms (the two sexes attached) in the wind-pipe which irritate and suck the blood.

Treatment. Place each chicken in a box about 9 in. × 9 in. × 9 in., with lid, and upon the floor sprinkle one teaspoonful of a mixture of one part by weight finely powdered camphor and two parts finely ground chalk. Close the lid, shake box to cause chicken to flap and blow dust about, which it inhales, causing it to sneeze up worms, which are collected and burnt. An expert can remove the worms from the windpipe with a feather stripped of its barbs.

Preventive. Clean rearing ground, or rear intensively for six weeks. If the soil is heavily contaminated with earthworms and slugs, which are the host of gape-worms, it should be evenly sprinkled during heavy rain with salt at the rate of one ton per acre. Rear chicks away from turkeys.

LEUKÆMIA (Big-liver Disease—phase of Fowl Paralysis)

Symptoms. Pale comb and wattles and unthrifty condition, but sometimes death occurs without any conditions of ill health being observed. The liver is enlarged to an immense size. Usually in pullets.

Cause. Virus. It is a disease of the blood-forming tissues.

Treatment. None.

Preventive. As for fowl paralysis. Certain strains appear highly resistant.

LICE

Symptoms. Irritation of skin; fowls peck abdomen.

Cause. Body parasites (lice) which live always on the fowls and burrow in the skin.

Treatment. Painting of top of perches with 40 per cent nicotine sulphate solution half an hour before birds go to roost or dusting well beneath the plumage with 5 per cent DDT powder or Gammexane, the effect of which lasts for a month.

Preventive. Difficult because of their rapid increase. Maintain perch-painting and dusting at regular intervals.

LIVER DISEASE

I have included this because sooner or later you will refer to it. It is the popular disease of lecturers and quacks. Liver pills have sold in thousands, and at fancy prices.

The liver is an important organ; but it can (and must) be kept in good order by accurate feeding, fresh air and good sanitation.

Any derangement is mostly due to the effects of a specific disease, to poisoning (phosphorus rat poison), to tumours, to wrong feeding or fowl paralysis virus (leukæmia).

MITES (Red)

Symptoms. Irritation on the perch; loss of body condition.

Cause. Body parasites (mites) which live in crevices and perch sockets and sally forth after dark to suck the blood of the fowls. The mites are grey before blood gorging.

Treatment. Painting perches with nicotine sulphate or dusting with 5 per cent DDT powder or killing the mites by swabbing likely hiding-places with paraffin.

PERITONITIS (Egg).

I consider this to be the final cause of death with a vast number of poultry which earlier suffered from such abnormalities as inflammation of the ovary or oviduct, or egg-binding or internal breakdown. Much of our present-day mortality can be traced to death from peritonitis, and it could be avoided if we paid far less attention to egg records and far more to general health and sound breeding as suggested earlier in this chapter.

RICKETS (in chicks)

Symptoms. Staggering, leg weakness and joint swelling.

Cause. Lack of vitamin D; insufficient or wrong balance of calcium and phosphorus in the minerals; absence of direct sunlight.

Treatment. Give cod-liver oil or vitamin D_3 supplement in the mash (p. 152); provide a correct mineral mixture (p. 151); allow the chickens direct sunlight (not through ordinary window-glass). Legs which are badly deformed may not be restored to perfection.

Prevention. Correct feeding and housing.

ROUP (*see* 'Contagious Catarrh')

SCALEY LEG

Symptoms. Raising of scales on the legs with encrustation beneath. In severe cases the bird cannot walk without severe pain.

Cause. The burrowings of the scaley-leg mite (not seen by naked eye). It is not caused by cinders, although such conditions may favour attack.

Treatment. Kill the mites by holding each leg for one minute in a long jar containing equal parts of paraffin and linseed oil (or old engine oil). Take care not to allow the liquid to reach the flesh.

Prevention. Clean litter, frequently renewed; freedom from dry dust.

TUBERCULOSIS

Another favourite disease of quacks, who wrongly regard every thin fowl as a sufferer from tuberculosis.

Symptoms. Vague until the disease has progressed, when the fowl shows pale comb and wattles, loss of flesh, ruffled plumage, watery droppings, and often lameness and joint-swelling. Appetite is usually good. Birds over eighteen months old suffer the highest mortality.

Cause. A germ which also affects pigs, so do not run them on same ground as poultry.

Treatment. None. Kill ailing fowls. Dispose of in-contact flock. Disinfect houses. Plough land and rest land six months.

Prevention. Really good stock, well managed. All new stock bought in can be tested, and only non-reactors accepted, although this is not common practice.

TUMOURS

Many post-mortem examinations reveal the presence of tumours, which may be described as masses of new tissue which develop independently. The causes are not properly understood, but the effects upon vital organs (such as the liver or intestines or ovary) are such as to lead to permanent ill health or death. Some strains of poultry appear to possess a high degree of susceptibility, and if one is the unfortunate owner of such a strain, it would be wise to clear it right out and build up another line of blood of high resistance.

Naturally, one would desire that one could ask a prospective seller as to whether his strain appeared to be resistant to the formation of tumours (or to fowl paralysis or leukæmia), but one cannot always rely upon an accurate

reply, for such knowledge may not have been available, or the breeder may not desire to decry the disease-resistant powers of the stock he is hoping to sell.

N.B.—As it takes some years to build up an outstanding strain of poultry, the new-comer would be advised to purchase his initial stock from, say, three well-known breeders, for by doing so the qualities and failings of each line of blood could be investigated and the proved superior strain retained and developed.

WORMS

Worms of many types appear to be normally present in the intestines of fowls of all ages. It is when they increase (outside the fowl) and are picked up in large numbers that ill-health is induced: (*a*) by irritation; (*b*) by blockage; (*c*) by the production of a poison; (*d*) by internal damage to permit the attack by another disease particularly tumours and fowl paralysis. To allow worms to reach this high degree of infestation results in a loss of stamina and vitality. On the other hand, to be constantly de-worming is not advisable, because the effects of the drugs used are somewhat severe.

Symptoms. General unthriftiness, loose feathering, shrinkage of and paling of head-gear, diarrhœa or constipation, erratic appetite, crop-binding and drooping of wings. One or more of these signs of ill health may be present, but it is necessary to establish the presence of worms in damaging numbers by a post-mortem examination, which will also determine the variety.

Cause. Heavy infestation with parasitic worms.

Treatment. The most efficient drug for cæcal worms and relatively harmless to the fowls is phenothiazine powder. For large flocks for a single dose mix thoroughly 2 lb. in 1 cwt. of mash (dry). For small flocks, give two level tea-

spoonfuls in the mash for eight birds nine–ten weeks old or for four birds ten–twelve weeks old. For treatment given daily extending over two weeks give 2 lb. per ton of mash. For individual dosing one $7\frac{1}{2}$ grain pill is correct for a bird of 5 lb.

A specific for large round worms is to give one capsule containing 1 to 2 c.c. carbon tetrachloride, according to the weight of the fowl.

The worm expellent for tape-worms is 'Kamala' 1-gm. capsule per adult fowl or 2 gm. for adult turkey.

Important. These drugs expel the worms, and to reduce the risk of re-infestation it is important for the three days after the treatment to collect and burn the night droppings. In severe attacks, where the soil is heavily contaminated, all the birds should be moved to fresh ground and the infested soil drenched with a strong solution of salt and water, or evenly sprinkled during a period of heavy rain with salt at the rate of 1 ton per acre, or ploughed up and cropped. Heaps of decayed manure and rubbish, upon which flies breed, should be sprayed with DDT water-miscible spray to kill the flies which act as the host to tape-worms.

Prevention. Having seen and investigated so much disease during the past twenty years, I believe that three vital secrets of good health are: (1) maintaining of clean ground; (2) having plenty of ground at one's disposal for movement of the poultry and for resting the soil and grass for periods of six months; (3) avoiding all overcrowding of runs or range. Worms would never then be a source of trouble.

VENT GLEET

Symptoms. Ulceration and redness of vent and offensive discharge.

Cause. Unknown.

Treatment. I have found liberal applications of acriflavine cream most efficacious.

Prevention. It is not a common disease, but may result from affections in the large intestine.

FOWL PEST (Newcastle Disease)

This disease, imported in table-poultry carcases, caused the slaughter of 800,000 poultry in five years. Provided the ban on imports remains, the slaughter policy will be regarded as better than that of vaccination.

Symptoms. Two forms: (*a*) acute and (*b*) mild. In the *acute* type, mortality is usually high and rapid. Indications are difficult breathing with rattling and gurgling, purple head-gear, nervous twitchings, some paralysis of legs and wings, mucus discharges from nostrils and eyes, ruffled plumage, loss of appetite and sometimes yellow, frothy diarrhœa. Egg production is quickly reduced.

In the *mild* form the symptoms may only be those resembling an outbreak of cold, with eye discharges and some throat-rattling. Occasionally there is some neck-twisting and odd movements, but often the only obvious sign of ill health is a sudden reduction in the egg yield. Birds may appear quite fit, but show a positive reaction to the blood test.

Cause. A virus transmitted through droppings and saliva, which contaminate food, drinking-water, land, litter, crates and appliances and houses.

Treatment. No cure. It is a notifiable disease, and at first suspicion the police should be advised.

Prevention. Boil all swill for one hour at least. Visitors must disinfect boots. Quarantine newly purchased poultry for twenty-eight days. Fumigate incubator. Keep up to date with latest information and orders.

OTHER DISEASES

These are legion, and include fowl typhoid, fowl cholera, laryngo-tracheitis, salmonellosis and nephritis.

On *any* outbreak of disease immediate attempts should be made to identify it accurately and to take appropriate measures to control, eliminate and check spread. Should it be found impossible to identify and control, then contact should be made with the County Veterinary Surgeon (Ministry of Agriculture, Animal Health Division) or the County Poultry Advisory Officer.

CHAPTER XV

SUBSIDIARIES

POULTRY farming is particularly well adapted for collaboration with other enterprises which not only yield a welcome extra profit, but also give considerable assistance to the preservation of good poultry health, and provide a means of maintaining a permanent, as opposed to a seasonal staff.

I do not intend to discuss major sidelines, such as market-gardening, flower-growing or the cultivation of farm crops (all of which are adequately covered in text-books), for although these are often successfully blended with poultry farming, they demand experience and specialized knowledge to a high degree.

The particularly valuable poultry subsidiaries are fruit, bees, goats, cows and rabbits, preferably kept on a system that will conveniently blend with the poultry business.

FRUIT-GROWING

Fruit-growing combines with poultry farming in an admirable manner. The trees provide shade and shelter; the fowls eat pests, manure the soil and keep the grass short. The trees are grown on the same land upon which the poultry are kept. Thus two sources of profit are available on the one acreage. The busy periods of either do not coincide.

Were I starting again and had ample capital, I should buy an orchard and install the fowls beneath it. If my financial resources were restricted, I would buy land on suitable soil, lay down to grass, set up the poultry and then plant fruit-

trees. If land had to be rented, then a clause would be inserted in the agreement stating that compensation would be paid, in the event of leaving, for increased value consequent upon the planting of trees.

Getting Advice. Fruit-growing must be regarded as a business venture, and therefore properly planned and efficiently managed. When once planted, fruit-trees remain for many years. Therefore, if the wrong varieties are selected, and other important essentials overlooked, the crop will be poor and profit negligible.

It would be well to study a simple book on fruit-growing dealing with commercial and not with garden practice. Three excellent ones are 'Fruit Trees', Bulletin No. 2 (Ministry of Agriculture); 'Tree Fruit Growing', vols. 1 and 2 by Raymond Bush (Penguin Books Ltd.) and 'Fruit Growing', by N. B. Bagenal (Ward Lock and Co.).

Having gained a general idea of what is wanted, you should make plans on paper, and then call in your County Horticultural Advisor for him to examine your suggestions. But make sure your intentions accord with the correct practices.

Types. The most suitable type of tree is the half-standard, which has a head 4½ ft. above soil-level, for it is easier to prune, pick and spray, and less liable to wind damage than the standard (6–7 ft. from ground) so often found in long-established farm orchards.

Moreover, half-standard trees are grown on the varieties of stocks which encourage fruiting at an early age.

The orchard is to be a commercial proposition. One can set aside a small area for growing several varieties for home use; but the orchard proper should consist of a few varieties which are known to be good sellers for market.

Varieties. These are undoubtedly profitable to plant:

Apples (Cooking): Bramley's Seedling, Newton Wonder, Annie Elizabeth, Monarch and Edward VII.

Apples (*Dessert*) *:* Cox's Orange Pippin, Worcester Pearmain, Laxton's Superb, Ellison's Orange and Lord Lambourne.

Plums : Victoria, Monarch, Czar and Pond's Seedling.

Damsons : Shropshire (for selling to canners); Farleigh and Merryweather.

Pears : Conference, Durondeau, Laxton's Superb and Dr. Jules Guyot.

Cherries : Governor Wood, May Duke, Waterloo and Morello (sour).

If the farm is in the south of England, I believe that a few half-standard *peach* trees would be worth planting in a sheltered position. Outdoor peach-growing has a distinct future, and if the trial trees do well, you may plant more. The best sort is Peregrine—see 'Peach Orchards', by J. Brooke (Faber and Faber).

Important advice needed is:

1. Where to buy to be sure of quality and the right stocks.
2. How to interplant to ensure fertilization.
3. Correct distances apart.
4. Particular sorts to suit your soil.
5. How to plant properly.

And later:

6. How to prune to train to shape.
7. The sprays to combat pests.
8. The most profitable markets, whether wholesale or retail.

BEE-KEEPING

Commercial bee-keeping requires considerable attention from June to August, but there is a ready sale for honey.

A start can be made with three hives to supply the home with honey and to discover whether you have the right demeanour to launch out into an apiary of fifty hives.

Bees are of great value for pollinating the fruit-blossoms. The hives take up little space, and can stand at the corner of a poultry-run. The bees and poultry live amicably together.

There is a bee-keeping instructor attached to your County Council, or you can study a book such as 'Beekeeping', Bulletin No. 9 of the Ministry of Agriculture, 'The Practical Bee Guide', by J. G. Digges (Simpkin, Marshall), and as you become proficient 'A Manual of Bee-keeping', by E. B. Wedmore (Edward Arnold and Co.).

Many people dislike bees because they 'sting'. This should be no deterrent, because if handled during calm, settled weather, and with gentle but firm actions, stinging is rare. Until one has gained confidence, both a veil and gloves should be worn, dispensing with the gloves when one finds, to one's surprise, that when bees alight on one's hands they do not necessarily sting.

The Hive. The popular hive is the 'British Standard', but whatever type is chosen at the start, keep to that right through, because all the parts are interchangeable, and much work and trouble are saved.

The hive (shell) is only a small part of the bee's home, for it contains a brood-chamber (living- and breeding-quarters) and above it one or more shallow frame-racks (the honey-storing department). It is therefore wise to purchase at the start from a well-known bee specialist a hive complete in every detail, plus needful accessories, such as veil, gloves, smoker, syrup-feeder and candy-box. All the frames should be fitted with full sheets (wired) of wax foundation.

The Bees. The best working bee for extracted honey is the pure Italian; but many strains are crossed with the

English Black bee to become lazy and vicious. Just as with poultry, certain strains of bees have proved their worth as honey-producers, and it is therefore wise to ask for some definite assurance from the seller that the bees are of good pedigree.

Much trouble is saved if one knows a nearby bee-keeper who will advise upon the practical side, and who may be able to sell bees the honey-producing abilities of which are known.

The cheapest way to buy bees is in the form of a swarm (in May, if possible, but not later than June), to hive them on frames of wax foundation and to watch their progress. It is rare that much honey will be produced in the first year.

Another method is to purchase a 'nucleus' consisting of the bees and a fertile queen (in lay) on three, four or five frames. These quickly build up to fill the brood-chamber, and will yield a limited quantity of honey the first season.

The most expensive method it to buy a 'colony', that is, a full brood-chamber all ready to start honey production. In a good season not only would 30–50 lb. of honey be stored, but another hive populated.

Excellent initial advice is:

1. Buy a hive of modern design, complete with all accessories, and get to know their use.
2. Stand it facing south in a sheltered spot away from a road or path.
3. Buy first-class bees of Italian blood.
4. Get used to handling the bees to gain confidence.
5. Attend to their needs immediately.
6. Maintain at all times (especially for wintering) strong, healthy stocks.
7. Leave ample honey for over-wintering.

GOATS

Goats are said to be smelly animals and to give strong milk; but these are criticisms unfair to a most valuable and intelligent beast.

The truth is that goats give amazing yields of the purest and highest-quality milk, free from taint and strong flavour; they are practically free from disease; they are economical feeders.

I am suggesting goat-keeping for three reasons: (*a*) to provide the house with unlimited quantities of Nature's most valuable food; (*b*) to make available a surplus of milk for feeding to chicks; (*c*) to convert into milk much free food grown on the poultry farm, such as hedge trimmings, fruit-tree prunings and coarse grass (hay) from runs.

Goats take up little time. From May to September they can be permanently tethered in runs to eat coarse grass and improve grass quality for the fowls. They need milking twice a day. If the natural food is plentiful, as it usually is, feeding of mash or corn is unnecessary during the summer, although one would not then expect record milk yields.

It is well to remember that goats are browsers (not grazers), and much more milk is yielded when they are fed on hedge or tree trimmings or have access to a varied assortment of hedgerow weeds than when tethered on grass.

Their house can be of the simplest design, and may well be portable. It can be open-fronted, and must be capable of keeping the goats dry, clean, and protected from severe weather. During decent summer weather the goats can be left out all night.

It is better to tether goats when kept in poultry runs, because if they are loose they have an objectionable habit of pushing on the netting and breaking it down. It is quite in order to tether them, but the more frequently the tether pole

is moved, the more food they will eat and the greater will be the milk yield.

Excellent breeds noted for high milk yields, and of especial value for poultry-farm conditions, are the Anglo-Nubian, the Saanen, the English and the Toggenburg. A pedigree goat is not cheap; but one should not study price when future yield is dependent on in-bred qualities.

A show winner is not required. A first-cross in-kid goat at its first or second kidding bred from good milking parents and in robust health would prove the best buy.

Our goat will not be stall-fed for high records of eight pints daily, but will have to feed on much natural food, live an open-air life for the five summer months and yield from four to five pints daily.

As for advice, there may not be a County Advisor. I suggest you join the British Goat Society (Hon. Sec. H. E. Jeffery, Roydon Road, Diss, Norfolk) and make friends with the nearest member, who will give all the help you want.

A simple book is 'Family Goat-keeping', by W. O'C. Holmes (*Goat Magazine*), and a standard text-book 'The Book of the Goat', by H. S. Holmes Pegler (*Bazaar, Exchange and Mart, Ltd.*).

COWS

As an alternative to goats, the milk supply can be obtained from cows, but I do not wish to infer that one should start up as a dairy-farmer. Cows should be kept as an adjunct to poultry. They will keep grass short in poultry-runs; maintain an even growth of herbage on land which is folded with poultry; improve grass quality; supply the house (and the chicks) with Nature's most valuable food.

Attention need not be irksome, and may follow on the lines suggested for goats, except that tethering is not satisfactory. For use in wire-netting runs a quiet Jersey cow

weighing no more than 800 lb. will produce 6,000 lb. of milk in a year. Where a meadow is available, unrestricted with netting, and where the fowls are in fold units or in slatted-floored houses, then one might consider a larger breed, such as the Red Poll or British Friesian, weighing about 10 cwt. and giving 7,000 lb. milk yearly.

Good grass during May and June can support a production of up to five gallons milk a day; but on ordinary pasture 3½ lb. of concentrated food must be given for each gallon of milk produced above two gallons.

The fear of transmission of tuberculosis from cows to poultry and vice versa is considered unfounded.

County official advice is freely offered. A simple but excellent booklet is 'Cows and Milk', the Young Farmer's Club Booklet, No. 10, and a more comprehensive publication 'Dairy Cows', by B. M. Cookson (Faber and Faber).

RABBITS

The combination of these with poultry is chiefly concerned with the grazing of grass, and thus free feeding. Rabbits appear to be favoured as a sideline on many poultry farms.

Rabbits can be kept successfully in small self-contained fold units or grazing hutches known originally as 'Morant' hutches. These are 6–12 ft. long, 3 ft. wide and 3 ft. high, and consist of an apex night-shelter hutch to which is permanently attached a 3-ft.-high wire run.

The floor is of ¾-in.-mesh wire-netting to protect the rabbits from vermin, but at the same time to allow of the grass to be eaten.

The unit holds up to twenty rabbits, and is moved once or twice a day across the grass of the poultry-run, thus feeding it down evenly and quite short. The poultry benefit from the short grass, and the rabbits obtain free food.

The whole scheme allows table rabbits to be produced at

a most economical cost, and sold at a worth-while profit, as well as providing tasty, highly nutritious meat for the table.

The most satisfactory meat breeds for the ideal type of carcase are the Dutch, Tan and Silver; but larger rabbits would be preferable on the fold system, such as the Flemish Giant or Belgian Hare.

First crosses are preferable because of their more rapid growth and more robust health, excellent crosses being Flemish Giant × Dutch and Beveren × Chinchilla.

There is perhaps one difficulty in mixing rabbits with poultry. The type of tuberculosis which affects poultry can cause the disease in rabbits. However, if one maintains a high standard of health in both types of stock, and if one allows a resting period of one month between removal of the rabbits and installing of the poultry, there should be no trouble.

As for advice, there may not be a county rabbit expert, but much valuable assistance can be obtained from the local society or from the British Rabbit Council.

Among books there is 'Modern Rabbit-keeping', Bulletin No. 30 of the Ministry of Agriculture and many specialist rabbit books published by *Fur and Feather*, Idle, Bradford.

PIGS

Perhaps because of the attraction of home-produced pork and home-cured bacon, I am frequently asked how pigs can be made to blend efficiently with poultry. It is not at all easy.

For a start, pigs are susceptible to infection from the poultry type of tuberculosis, and should not therefore be run on the same land as poultry. If the fowls were tested for tuberculosis reaction and proved negative, such a danger would be greatly minimized.

It is difficult to find an instance where pigs prove of

specific value for poultry management. Pigs are not good grazers; they eat the grass unevenly, and they tend to leave the soil surface irregular.

However, a fold unit consisting of a light, portable house with attached run as a unit on wheels has proved satisfactory for a farrowed sow with pigs a fortnight old. The unit is moved across grass daily; but there is the need to cart food and water each day.

There is also the practice of tethering, in which the sow is tethered with a leather harness connected to a stout chain and steel pin in the ground. The pigs with the sow have free range; but the sow is so controlled that her range is limited by the chain, which allows her to enter the small movable house. The outfit must be moved daily.

Every poultry farmer should keep a few pigs to provide meat for the house and to eat up fallen apples, but the best place is in a hygienic sty placed close to the general range of farm buildings and near the food-store.

Cross-bred pigs should be used, to ensure quick growth and hybrid vigour. The most satisfactory cross is a Middle White Boar on Large White Sows.

Every county has an official pig expert. The subject can be studied in 'Pig-keeping' (Young Farmer's Club Booklet, No. 4), or in 'Pigs', by V. C. Fishwick (Crosby Lockwood, Ltd.).

HOME-PRODUCED FOOD

The world is likely to be short of food for years, and Great Britain short of purchasing power. The poultry farmer is in an enviable position to provide his home with the finest health-giving goods, and the adoption of the subsidiaries discussed in this chapter is strongly urged. The home can then be assured of never-failing supplies of new-laid eggs, table-poultry, fresh fruit, honey, beeswax, milk, butter,

cheese, rabbit flesh, pork and bacon. With a suitable sugar supply one may add bottled and canned fruits and vegetables, jams, jellies, conserves, marmalades, syrups, candied fruits, chutneys, wines and cider. Full information on the preparation of these is given in 'The Complete Book of Home Food Preservation', by Cyril Grange (Cassell and Co., Ltd.).

CHAPTER XVI

GLOSSARY OF TECHNICAL TERMS

As in any specialist undertaking, the words used by skilled poultry keepers may be misunderstood or unintelligible to the beginners. Such technical terms as are not explained elsewhere in the book are given below.

Abdomen. The soft part of the rear of the body between the vent and the end of breast bone.

Accredited Breeder. A breeder whose farm has been officially accredited by the County Authorities.

Addled Egg. An egg in which the living embryo died during incubation.

Adult. A pullet which has started to lay; a cockerel at nine months old.

Air Space. The clear portion, containing air, inside the large end of an egg.

Albuminoids. The protein or flesh-forming constituents of a food.

As Hatched. Refers to unsexed day-old chicks packed for sale as they are hatched in the incubators.

Auto-sexed. The offspring of a breed whose sex is capable of being distinguished by fluff-colour.

Axial Feather. The single short feather between the primaries and secondaries in the wing.

Bacilli. Microscopic germs.

Bantams. Diminutive forms of large poultry.

Barred Plumage. Alternate bars or stripes of light and dark colour across the feather.

Battery. Tiers of wooden or metal cages one upon another to house poultry of varying ages.

Bay. Reddish-brown chestnut colour—for example, of eyes of Wyandottes; also that area of plumage on the wing and seen when the flight secondaries are closed.

Bean. The bean-shaped tip at the end of a duck's bill.

Beard. A group of feathers under the throat of such breeds as Faverolles.

Beefy. Thick, coarse, overgrown combs on single-combed light breeds.

Bill. The 'beak' of water-fowls.

Blade. The rear part of a single comb.

Bloom. The sheen or gloss on plumage or the clean matt surface of an egg.

Booted. Fowls which have feathers on the toes, for example, Brahma.

Brassy. The yellow plumage sometimes found on the backs of males of white and red breeds (a defect).

Breast. That part beneath a fowl from the crop to the abdomen. (Not to be confused with chest.)

Breed. A distinctive race of fowls possessing the same fixed characters of shape, size, temperament, etc. (*N.B.*—Colour determines the 'variety' of a breed.)

Cape. The feathers beneath the neck hackle, between the shoulders.

Capon. A castrated or de-sexed male (distinguished by undeveloped head-gear and profusion of hackle feathers).

Candling. The process of inspecting eggs by means of a powerful light to determine internal quality for table or hatching.

Capacity. The distance between the pelvic bones and the end of the breast bone.

Carriage. The bearing, pose or style of a fowl when standing or walking.

Caruncles. The irregular, fleshy growths on the head of a turkey.

Case, of Eggs. Three hundred and sixty eggs.

Chest. That part of a fowl from the throat to the front of the breast-bone.

Chick. A young fowl from day old to weaning (six weeks).

Chicken. A young, growing fowl (over six weeks); or a tender roasting-fowl.

Chicken Class. At shows is eligible for birds hatched on or after November 1 of the previous year.

Clutch. The number of eggs laid without pause by a fowl; or the number sat upon in one nest.

Cobby. Squarely built, short and blocky in body-size.

Cock. A male fowl after its first full annual moult (that is, over seventeen to nineteen months old).

Cockerel. A young male before its first normal moult (in Show Rules, means a bird hatched on or after November 1 of the previous year).

Cockerel-bred. A term to indicate a bird bred from a pen to produce true-to-type cockerels.

Comb. The fleshy growth at the top of a fowl's head.

Compound. A term used by corn merchants to denote a mixed mash.

Condition. The general health, cleanliness of plumage and brightness of headgear.

Crest. The tuft of feathers on the head (for example, on Poland fowls).

Creamy Plumage. The faint yellow pigment in newly grown feathers.

Crop. The food-collecting organ in front of the chest.

Cross-bred. Usually the progeny from the indiscriminate mating of pures or crosses. May refer to a first-cross (which see).

Cull, To. To handle and examine fowls to discard the worthless.

Cushion. The mass of plumage at the rear of the back of some females (for example, Cochins).

Deaf-ear. An old name for the ear-lobe.

Dealer. A person who buys and sells poultry of all ages; usually unreliable.

Defect. Any fault, blemish or imperfection or departure from the standard.

Dewlap. The loose skin below the beak (for example, in Toulouse geese).

Diamond. The wing bay (*see* Bay).

Dominant. A character which appears in the first hybrid generation, for example, rose comb is dominant over single comb.

Double-laced. A double ring of colour upon a feather.

Double Mating. The use of two breeding-pens for one breed, one to produce show winning males and the other females. (The need for double mating reduces a breed's popularity.)

Down. The plumage of a newly-hatched chick; the under-feather of ducks and geese.

Drake. The male of the duck family.

Drakerel. A young drake.

Dressed Fowl. A dead fowl plucked and cleaned ready for cooking.

Dubbing. Removing the comb and wattles (to improve fertility of light-breed males and to prepare Game fowls for show).

Duck. The female of the duck family.

Duck-footed. A fault of fowls in which the hind toe is carried forward to lie close to the lower part of the foot.

Ducklet. A young duck in the growing stage.

Duckling. A young duck from day old to six weeks; or a young table duck at ten to twelve weeks of age.

Ear-lobes. The small unfeathered area of skin just below the ears.

Embryo. The undeveloped chick germ within the egg.

Excreta. The waste matter expelled by the fowl; droppings.

Face. The area of bare skin around and below the eyes.

Faking. Steps taken in the preparation of a fowl for show or sale to deceive the judge or buyers.

Fancier. A poultry keeper who breeds, keeps or exhibits fowls chiefly for their beauty and standard characters.

Feather-legged. Having feathers on the legs, for example, Brahmas.

Fertile. Applied to an egg which contains a living embryo chick.

Fifth-toe. Most breeds have four toes on each foot, but a few breeds have an extra toe at the rear, for example, Dorkings and Faverolles.

First-cross. The offspring from the mating of two different pure breeds and varieties and possessing hybrid vigour when egg or table production is the aim. The breed of the male is given first, for example, Rhode Island Red × Light Sussex.

Flights. The outside ten quill feathers of the wing (best seen when the wing is extended).

Fluff. The original down of day-old chicks; also the soft plumage on the thighs and abdomen of an adult fowl; also the soft fluffy plumage at the base of a feather.

Fowl. A general term for domestic cocks, cockerels, hens and pullets.

Frizzled. Feather which is naturally curled backwards over itself, for example, the Frizzle fowl.

Furnished. Applicable to a fowl which has its complete covering of adult feathers.

Gipsy Face. The face skin being dark purple red in colour.

Ground Colour. The basic predominating colour of a feather.

Gullet. The loose protruding skin below the beak in front of the throat (usually found on old hens and on Toulouse geese).

Hackles. The feathers upon the neck and upon the saddle (usually rounded in the female and pointed in the male).

Hatchability. The ratio of the number of chicks which hatch from a given number of eggs.

Hatchery. The business of buying in eggs from selected flocks, hatching them and selling the chicks.

Handling. The individual manual examination of poultry to determine quality, health, etc.

Hard-feather. A term to describe the sparse tight plumage of Game fowls.

Headgear. The comb, wattles and ear-lobes.

Hen. A female fowl after its second full annual moult (that is, over twenty-nine months old) (also *see* Yearling). In the Poultry Press advertisements a hen refers to a fowl over twenty-four

months of age; in table poultry a hen is a female fowl which has begun to lay, that is, about seven months.

Hen-feathered. A male having rounded neck and saddle hackle feathers, instead of pointed (for example, Sebright bantams).

Hock. The joint of the leg with the thigh.

Hybrid. The offspring of fowls of different breeds or varieties.

In-breeding. The mating of closely related poultry, for example, brother to sister.

Keel. The breast bone; in exhibition ducks the pendant fold of skin hanging below the breast-bone.

Knock-kneed. A deformed condition in which the legs bend in towards one another at the hocks.

Lacing. A stripe, border or edge round a feather of a different shade or colour from that of the ground, for example, in laced Wyandottes.

Leader. The single spike at the rear of a rose comb, for example, on Wyandottes.

Leg. The lower part of the shank which is covered with scales. Does not include the thigh.

Leggy. Too long on the leg.

Leg Feathers. The plumage found on the outer side of the leg of such breeds as Brahmas and Faverolles.

Line-breeding. The mating of birds of the same blood line.

Lobes. The small unfeathered area of skin below the face.

Long Hundred. One hundred and twenty eggs.

Mandibles. The upper and lower halves of the beak.

Mash. A mixture of meals to form a balanced food. May be fed wet or dry.

Mealy. Feathers stippled or dusted with a lighter shade. Usually refers to a defect.

Mossy. Irregular indistinct dark markings in a feather to spoil the brilliancy of contrast (a defect).

Moult, To. To change and renew a part or the whole of the plumage.

Mucus. A thick secretion of the membranes of the throat, nose, etc.

Muff. The cluster or tuft of feathers on each side of the face of such birds as Houdans and Faverolles.

New Breed. A breed not yet accepted to the Poultry Club standards.

Non-sitter. A fowl of a breed which does not possess the inherited instinct to hatch eggs.

Not Sexed. Refers to day-old chicks which are sold straight from the incubator as hatched and have not been sexed.

Ovary. The organ in which the egg yolks are produced.

Oviduct. The tube-like organ through which the yolk passes to receive the white and shell.

Parasite. A harmful pest subsisting at the expense of the fowl.

Pedigree. The history of the parents, which should be as complete as possible. A fowl cannot be regarded as pedigree unless it has individual qualities recorded from its parents. May be concerning egg production, showing, etc.

Pelvic Bones. The two short bones whose ends are felt close to each side of the vent.

Pencilling. Fine stripes or marks which may be straight across the feather, *V*-shaped, crescent-shaped or parallel to the feather outline.

Pigment. Colouring matter in egg yolk; in yellow legs; in brown egg shells.

Pinion Feathers. The small stiff feathers on the end segment of the wing.

Poult. A young turkey before sex is discernible.

Poultry. All domestic fowls, ducks, geese, turkeys and guinea-fowls.

Poulard. A de-sexed female fowl.

Primaries. The outside ten quill feathers of the wing. Also known as Flights (not visible when the wing is closed).

Pullet. A female fowl before its first complete annual moult (that is, under seventeen to nineteen months old); in show rules a bird can be shown in the 'pullet class' if hatched on or after November 1 of the previous year. In Poultry Press advertisements, a pullet refers to a fowl up to twelve months of age.

Pullet-bred. A term indicating that a fowl was bred from a pen mated to produce true-to-standard pullets.

Quill. The hard stiff feathers of the wings and tail.

Rearability. The ratio of the number of pullets and cockerels reared from a given number of day-old chicks.

Recessive. Characters which disappear or are inhibited in the first hybrid cross.

Reversion. The appearance of chicks having features of remote ancestors.

Roach-backed. A bent or hunch back (a deformity).

Rust. An area of red or brown found as a defect on wings and breast.

Saddle. The rear part of the back of a male fowl.

Saddle-hackle. The pointed feathers hanging from the saddle over each side of the back.

Sappiness. The cream colour of new plumage which is not fully developed.

Secondaries. The fourteen quill feathers on the wing counting from the body.

Segregate, To. To divide or separate into groups, for example, of males and females.

Self Colour. A uniform colour all over the body (showing no lacing).

Sexed Chicks. Chicks sexed and sold as of a definite sex, male or female.

Sex-linked. The offspring from the mating of two breeds or varieties whose sex can be distinguished by fluff colour and other features.

Shaft. The stem of a feather.

Shafty. A feather which is of a lighter colour on the stem than elsewhere (usually a defect).

Shank. The lower part of the leg covered with scales and excluding the thigh.

Sheen. Brilliancy and glossiness on black feather.

Show Rules. The rules of the Poultry Club—governing body of exhibitions and shows.

Sickles. The long, curved feathers in the tail of a male fowl.

Side-sprig. A pointed growth on the side of a single comb (a defect).

Sit, To. Referring to a hen covering eggs to hatch them.

Sitter. A fowl of a breed which has the instinct to sit upon eggs to hatch them.

Smut. Dark feather or black markings upon the top or under colour (a defect).

Spangling. A clearly defined spot or blob of colour on each feather.

Split-wing. A wing showing a gap between primaries and secondaries.

Sport. A reversion or throw-back differing from the normal type.

Sprig. *See* 'Side-sprig'.

Squirrel-tail. A tail which bends over the back (a defect).

Stag. An adult male turkey.

Standard-bred. A fowl possessing shape, colour, markings and features according to the Poultry Club standards.

Stock Sires. Selected male birds for breeding.

Strain. A particular blood line of a breed which, being under one breeder's care for a number of years, has acquired certain valuable fixed characteristics. The word strain prefixed by figures denoting egg production is misleading.

Stub. The short undeveloped quill of a new feather protruding up to 1 in. through the skin.

Stub, To. To remove the short stubs from a carcase after rough plucking.

Tail-coverts. The soft curved feathers in front of and at the sides of the tail.

Tail Feathers. Refers only to the straight stiff quill feathers.
Thigh. That part of the 'leg' above the hock.
Thumb-mark. A depression on the side of a single comb (a defect).
Tom. An adult male turkey (*see* Stag).
Top-colour. The colour seen on the feather surface.
Trio. One male and two female fowls.

Undercolour. The colour of the fluff or that part of the feather not seen upon the surface.
Utility. Referring to a fowl bred for laying purposes.

Variety. A subdivision of a breed differing in colour and marking or comb shape.

Wattles. The two fleshy pendant growths below and each side of the beak of both male and female fowls.
Web Feather. The flat part each side of the quill or shaft.
Web, of Foot. The skin between the toes.
Web of Wing. The triangular area of skin seen when wing is open.
Whip Tail. The slim narrow tail, for example, of a modern game.
Wing Bar. A line of colour across the middle of the wing (when closed).
Wing-bay. The triangular section of the folded wing beneath the wing bar.
Wing-bow. The shoulder of the wing.
Wing-butt. The end of the primaries.
Wry Tail. Held to one side of the body; not vertical (a defect).

Yearling. A female fowl between its first and second full annual moult (that is, between seventeen and twenty-nine months of age). In Poultry Press advertisements, a fowl between twelve and twenty-four months old.

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